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The London Coal Trade

R. C. ESTALL

PROBLEMS OF FUEL AND POWER SUPPLY have proved to be among the most intractable of the United Kingdom's post-war difficulties. These problems have arisen mainly out of the inability of national coal production to equal, or even approximate to, national requirements. In this situation questions relating to the origin and utilization of power supplies become of vital importance. Far reaching changes in power sources are envisaged and, within the near future, alterations are bound to occur in the patterns of coal consumption.[1] Those areas of the country devoid of local coal resources will experience a major change in their energy sources for, in the main, coal will be most economically consumed in the coal-producing areas. Existing plans for the increase of coal-fired power station capacity and considerations leading to the location of the first nuclear power stations give adequate testimony of this fact.[2]

It is instructive, therefore, to analyse the present patterns of coal supply to the coal-deficient regions of the country, which are mainly south of a line joining the estuaries of the Severn and the Nen. These southern regions consumed about 50 million tons of coal in 1954. Such a volume of trade affects the interests not only of many people in the mining areas, but also of those whose work is the transport and merchanting of the coal, whether in practice or on paper, before it eventually burns in the furnace or fire of the southern consumer. A great deal of capital (e.g., in colliers, railway and dock facilities, road transport media) is tied up in the southern coal trade.

Dominating the southern coal market, however, is the London Consumer Region which in 1954 received almost 50 per cent of the total allocation to the southern regions. It is intended, therefore, to analyse the features of coal supply to this important region. To a certain extent the issues discussed will be peculiar to London itself, but the more important features are relevant to coal movement to other coal-deficient regions.

Sources of supply and related considerations.

Although the London Consumer Region[3] is the smallest by area in the country it contains almost 8½ million people whose industrial, commercial and domestic coal requirements approximated to 24 million tons in 1954 (home supplies plus imports), or about 12 per cent of the total inland coal allocation in that year. This percentage falls substantially short of the region's share of the total population of the

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United Kingdom (about 17 per cent) but the apparent anomaly is readily understandable in terms of industrial fuel requirements. The coalfield regions generally consume greater quantities per head, but their industrial potential naturally contains the coal-hungry industries that are attracted to such areas. London's lighter industrial structure is reflected in a much lower direct consumption of raw coal by industry. Nevertheless total coal requirements are large and important.

With one exception—the North-Western Division—every coal division in the country shares in the London market, though their importance varies greatly. In analysing the trends evident from Figure 1 it must be borne in mind that, during the period under review, the flow of coal from producing areas has not been governed primarily by cost considerations or consumers' preferences. The inability of supply to equal demand at prevailing prices necessitated the introduction of a system of allocation which could cut across what may be described as a "normal" flow to markets based on economic criteria. Thus Yorkshire house coals have recently disappeared from the London market. This is by no means the result of a declining demand for these coals for, although their superiority is questioned by some workers in the coal industry, they remain highly popular with the householder. London dealers would be willing to pay higher prices if supplies could be obtained but Yorkshire house coals are now allocated elsewhere, e.g., to the adjacent Lancashire region where domestic consumption is rising while local output of domestic coals is falling. London now receives its house coals mainly from Leicestershire and Warwickshire. Price structure and freight rate structure also affect coal movement and are discussed below. With these points in mind we may proceed to examine the movement of coal to London at the present time.

The East Midland, the Durham and the Northern divisions (the latter entirely from Northumberland) provide a high proportion of the total home-produced supplies (about 80 per cent in 1954), but important trends are evident. The Northern Division's supplies fell by one million tons over the period, lowering its share of the London market from 23·3 to 17·8 per cent. Changes in the conditions of production and demand for power-station coal account for this. Power-station requirements in the Northern Consumer Region (mainly Northumberland and Durham) rose by half a million tons between 1948 and 1954, but the output of coal allocated to power stations from the "local" coalfields fell by 1 million tons. "Exports" were therefore cut and a reduction of one million tons was made in supplies to the London region. *Power-station* coal still formed about half of Northumberland's coal shipments to London in 1954 however, being particularly economical for Thameside power stations and meeting 28 per cent of the total London requirements for this grade of coal (see Fig. 2 for types of coal supplied by divisions). Most of the remaining Northumberland coal is of *general industrial* varieties.

Sharply in contrast to the Northumberland decline is the increase of supplies from the East Midlands from about one-quarter to about one-third of the London total. In this case the change was due almost entirely to an increase in supplies to power stations. Seaborne supplies from this division to Thameside power stations have increased sharply in recent years, while North London "inland" stations are more conveniently served by rail from this division than from any other. The East Midlands is meeting London's increasing requirements for power-station coal and is making good, declines in other sources of supply. The quantity sent in 1954 was double that of 1948 and met about 47 per cent of London's power-station requirements. This division also dominates the *house coal* market, supplying some 65 per cent of the total in 1954.

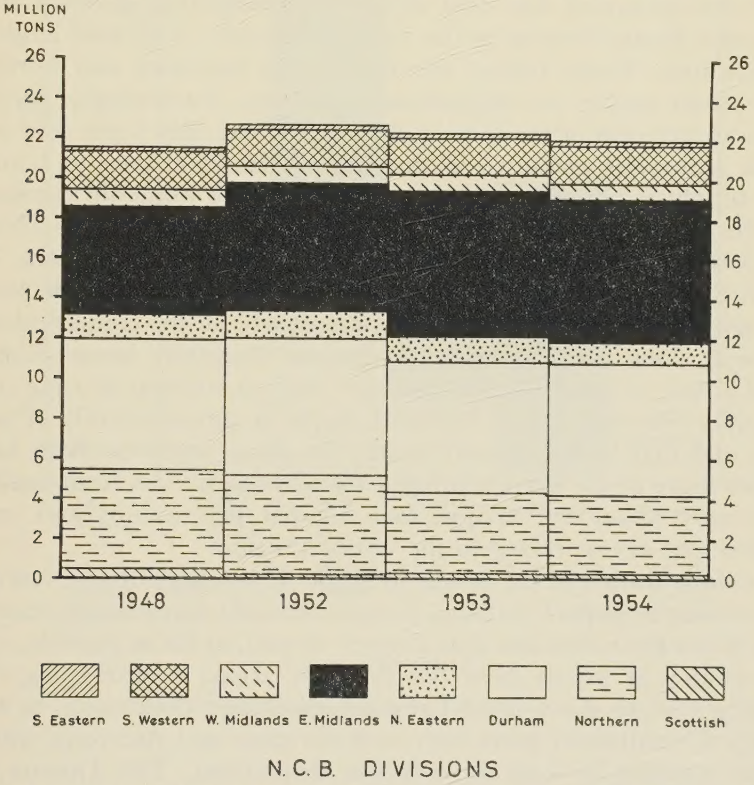

Fig. 1.—Share of Coal Divisions in London's coal supply 1948 and 1952–4. The statistics from which this figure was drawn were collected over the years 1948–54 only, and are no longer compiled on the same basis. The years end in October, and the figures for 1948 were based on a holiday-free sample. Comparisons between 1948 and 1954 are made in the text only where a trend is evident from statistics for intervening years.

Durham was displaced by the East Midlands as London's chief source of supply in 1953, but in 1954 still supplied 29 per cent of the total. The decline was relative, not absolute, for the quantity was maintained at about 6·5 million tons throughout. *Gas coals* dominated the trade, meeting three-quarters of London's gaswork requirements. The famous Durham *coking smalls* (for furnace or foundry coke) do not figure prominently for, though they monopolize the London market, that market is exceedingly small.

Of the remaining five coal divisions participating in the London trade the South-Western is the most important. The coal is almost entirely from South Wales; the Bristol and Somerset and Forest of Dean areas supply an insignificant quantity. Surprisingly perhaps, under 12 per cent of the total is anthracite, and only 6 per cent of all Welsh anthracite marketed in the United Kingdom goes to London. This supply is important, however, to London's domestic consumers and the nursery industry. Of other varieties about half goes to Thameside power stations and most of the rest to domestic consumers. The North-Eastern Division's share in the trade is small and declining. The million tons provided in 1954 was nearly all for consumption in gasworks along the Thames. The famous Yorkshire house coals, as noted above, are no longer important—only 30,000 tons in 1954 (none in 1956). The small West Midland supply is almost entirely of house coals, and that from Scotland mainly for power stations. Both had a smaller share of the market in 1954 than in 1948. The Kent coalfield raises only about 1·5 million tons of coal per annum and under 200,000 tons are marketed in the London region.

A unique feature of the power situation in post-war Britain has been the necessity to import coal and, in order to avoid unnecessary transport costs, it has been desirable that imports should, as far as possible, enter the country at points near the deficient areas. Ocean-going ships bringing coal to the United Kingdom discharge their cargo at well-equipped continental ports such as Rotterdam and Antwerp, whence colliers tranship the coal to its British destination. The Thames coal wharves (which cannot handle the ocean-going vessels) are conveniently located to receive this coal and, out of the 12 million tons imported in 1955, 5·5 million entered the country via the Thames. Estimates of the quantities of imported coal consumed in the London region in relevant (calendar) years are as follows:

1948	100,000 tons	1953	300,000 tons
1951	200,000 tons	1954	1,300,000 tons
1952	100,000 tons	1955	4,000,000 tons

Much of this coal has been of general purpose varieties from the U.S.A. for use by domestic, steam-raising, gasworks or general industrial consumers. But it proved unpopular. Industrial users maintained that their plant was not designed to burn this type of coal, while domestic consumers are apparently of a very conservative disposition and expressed dissatisfaction with its burning qualities. Coal distributors thus became reluctant to handle these imports and ultimately the gas

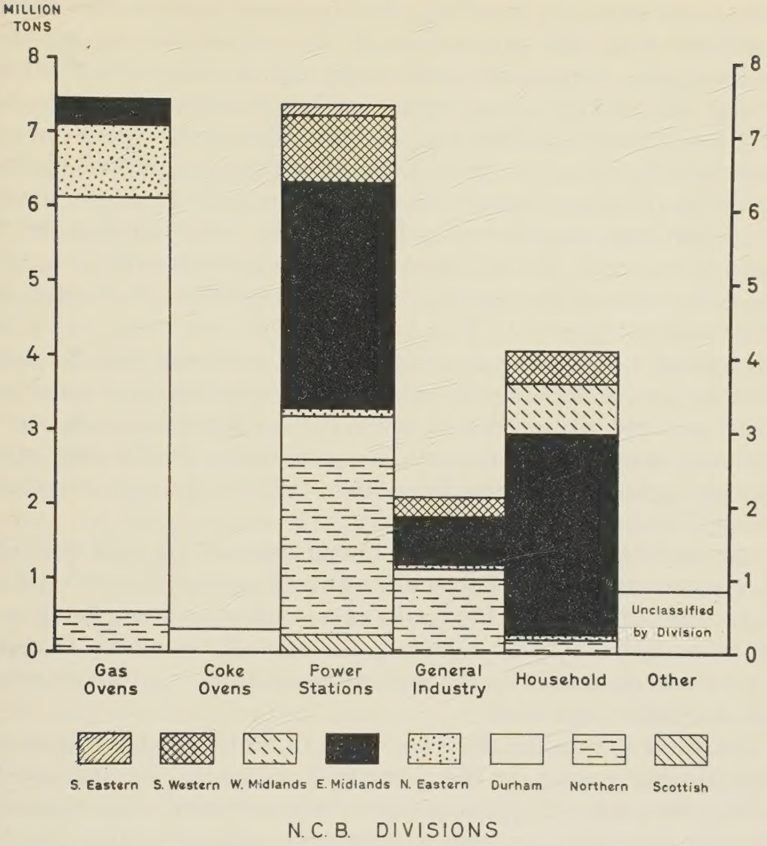

Fig. 2.—Coal consumption in London, average 1952–4.

industry and the railways absorbed most of it. Quantities imported fell sharply in 1956.

Transport forms and cost considerations.

When the supply of coal to London began some centuries ago the only practicable form of transport was by sea. For such a trade the Northumberland and Durham coalfields were in a position far superior to that of any other field, and a monopoly was established that lasted well into the nineteenth century.[4] In the early years this sea-coal was consumed in the brewing, lime-burning, glass-making and dyeing industries, but its use was considered objectionable until wood fuel became scarce in the seventeenth century. Then the undesirable smoke became respectable and more coal was shipped in for domestic use. The gradual expansion of the trade from about 216,000 tons in 1650 to 1·3 million tons in 1800 was largely a function of increased domestic demands as the population of the city and its environs grew, though industrial uses were also growing. By 1900 consumption had reached 15·7 million tons, the population of the region having grown to 6·5 million (from about 1 million in 1800) and the demands of industry and the public utilities having expanded sharply, especially since about 1860. The greater quantities and varieties demanded called for more attention to be paid to the types of coal brought in, while new forms of transport[5] enabled other coalfields to share increasingly in the market. London's domestic requirements, for example, were found to be best served, in the main, by rail from coalfields conveniently located to supply many inland distributing centres from which the householder could be efficiently served. This saved difficult and costly hauls from the docks and avoided the degradation that coal inevitably suffers in the loading and unloading of colliers; the consumer thus received a coal better suited to burning in open grates. Durham coals, on the other hand, were highly suitable for gasification and could supply Thameside gasworks direct from the colliers, gaining maximum economies from the sea voyage.

By the middle of the nineteenth century about 3·5 million tons of coal were arriving, still mainly by sea and from Northumberland and Durham. But in 1845 the first railborne supplies arrived; in 1850 the railways brought in 56,000 tons (1·5 per cent of the total); five years later a million tons and, by the end of the century, 7·7 million tons or almost one-half of the total.

In the present century the two forms of transport have competed strongly for supremacy in the London coal trade. During the first thirteen years seaborne quantities generally exceeded railborne, while in the next thirteen years the position was reversed. Since the later 1920's, however, seaborne totals have grown substantially due mainly to rising demands by the Thameside utilities. The following table gives statistics for representative years:

	Railborne	*Seaborne* (million tons)	*Total*
1900	7·7	8·0	15·7
1910	7·8	8·9	16·7
1920	10·1	7·8	17·9
1930	8·0	10·9	18·9
1940	9·1	9·8	18·9
1950	8·5	15·0	23·5
1955	7·4	13·8	21·2

(Note: Difficulties of sea transport in the early years of the Second War caused a temporary decline in seaborne quantities; the sharp fall for 1955 is attributable to coal and rail strikes in that year, the total being maintained at about 25 m. tons by foreign imports.)

The cost considerations relating to the movement of coal are interesting and important.[6] The consumer in London, and elsewhere, desires to obtain his coal at the cheapest price, consistent with the quality required. In a free market the cheapest price would reflect the cost of production at the pithead plus costs incurred in transport and delivery, which add considerably to pithead prices, as shown below. These features determined the flow of coal to London before the war, and the patterns then established are not without relevance at the present time. But notable changes in the field of coal supply have occurred since the war which affect the economics of coal transport and marketing. Pithead prices no longer reflect the costs of production at individual pits, while the patterns of flow are indirectly influenced by the Ministry of Power which decides from which coalfields London's supplies shall come. As mentioned earlier, the absolute shortage of coal and the need for allocation schemes also affect distribution costs.

The effect of price structure is paramount, house and industrial coals being marketed under separate pricing schemes. House coal is marketed at "zoned delivered prices", the country being divided into 64 zones within each of which one set price obtains for each of the seven grades of house coal supplied. No adjustment is made according to coalfield of origin or distance travelled, though the original price calculations took into account the average rail rate to each zone from supplying areas in "normal" years. The effect is to prevent normal economic forces from operating to vary the source of supply and methods of transport.

For industrial grades the system differs. The pithead price of coal has relevance, but is not based on costs of production but on the quality of the coal—its value to the consumer. This is fixed with reference to its calorific (British Thermal Unit) value, ash content, size of coal, need for preparation (i.e. for grading and washing) and certain commercial considerations. This theoretical assessment is the basis of price, and similar grades of coal have the same pithead price irrespective of coalfield of origin and production costs. Unless modified, this pricing scheme would have marked effects upon production and movement of coal, for the demand for coal from each field has always in the past been based on costs of production and transport advantages to various markets. A price system which eliminates cost of production as a factor in the pithead price of coal changes, in a fundamental way, the supply positions of all coalfields. The result, in practice, would be to disrupt the patterns of distribution which have evolved over many decades, and to cause "great confusion and also grave economic effects in some districts".[7] To avoid this a system of "coalfield adjustments" has been adopted with the object of "maintaining approximately the present relations between the main producing districts and their various markets".[8] An addition is therefore made to the pithead price of coal in order to offset differences in transport costs to various markets. The system is not unlike the old "Pittsburgh Plus" system in U.S.A., with the Yorkshire and most of the East Midland coalfields as the base points. These two fields have no addition to the pithead valuation of each ton of coal, while the East Kent field has 20s. 5d. added to each ton. Other areas carry coalfield adjustments of between 1s. 7d. and 12s. 7d.[9]

This price policy affects the economics of coal movement from various fields to consuming areas, including London. Northumberland, for example, starts off with a price disadvantage at the pithead, on an identical grade of coal, of 5s. 6d. per ton compared with Yorkshire or Nottingham. Thus any freight advantage in shipping coal to London from Northumberland is diminished by that amount. On the other hand, however, the Yorkshire and Notts. fields have a superior production cost position that is nullified by the pithead valuation policy.

The economics of coal movement to London by rail and sea are also affected by the structure of freight rates. In the moving of coal the sea voyage has great savings to offer per ton/mile. This has always been true, but freight charges have recently moved even more definitely in favour of sea transport. While railway rates on coal have risen almost 300 per cent since pre-war, the coasting coal rate has risen less than 60 per cent. The sea transport economy is, however, diminished by high handling costs at the points of loading and discharge and the coal suffers in the handling. Seaborne coal from Northumberland contains some 30 per cent slack by the time it is discharged at the London wharf. This is undesirable for some uses, but consumers of small coal (especially the power stations) can benefit from the cheapness of the sea voyage. The high handling costs, however, cause the difference in delivered prices of seaborne and railed coal to be smaller than simple comparison of freight rates would suggest. A simple case involving the transport of a ton of coal of identical grade from the East Midlands by rail, and from the Tyne by sea to London will serve to illustrate the position. The pithead prices are identical (though costs of production strongly favour the East Midlands) but the Northumberland ton bears a coalfield adjustment of 5s. 6d. which must enter our reckoning.

One ton of coal loaded and railed from East Midlands (e.g. Mansfield colliery) to London (e.g. Tottenham rail depot):		£1 18s.
One ton of coal from Tyne to London (e.g. Albert Dock):		
Coalfield adjustment	5s. 6d.	£1 11s.
Leadage at Tyneside	6s.	
Freight	15s.	
Discharge at wharf, screening etc.	4s. 6d.	

At Albert Dock there is approximately 7s. in favour of the seaborne ton, which gives a significant cost advantage to waterside consumers taking coal direct from the colliers. How far inland this advantage reaches depends largely on the form of transport used to move the coal from the wharf. If the coal has to be moved inland by rail, a minimum railway rate of 6s. per ton must be paid, however short the haul. Thus our seaborne ton loaded on a railway wagon at the receiving wharf has only 1s. price advantage over the equivalent ton railed to North London, and the two forms of transport will compete almost on terms of equality. Movement from the wharf is, however, cheaper by road. Up to about a three-mile radius the road charge adds only about

4s. 6d. to the price of the ton of coal; to a five-mile radius about 5s. 6d. and to an eight-mile radius about 6s. 6d. Thus if road haulage is possible from the riverside, seaborne coal has a cost advantage over the railborne ton at the rail depot for a distance up to about eight miles from the wharf. This seaborne advantage is enhanced by the fact that, if the railed ton from the East Midlands is to finish its journey by road, the minimum charge for moving the ton from wagon to lorry is 4s. 6d., while to unload the railway wagon direct to the consumer costs 3s. per ton.

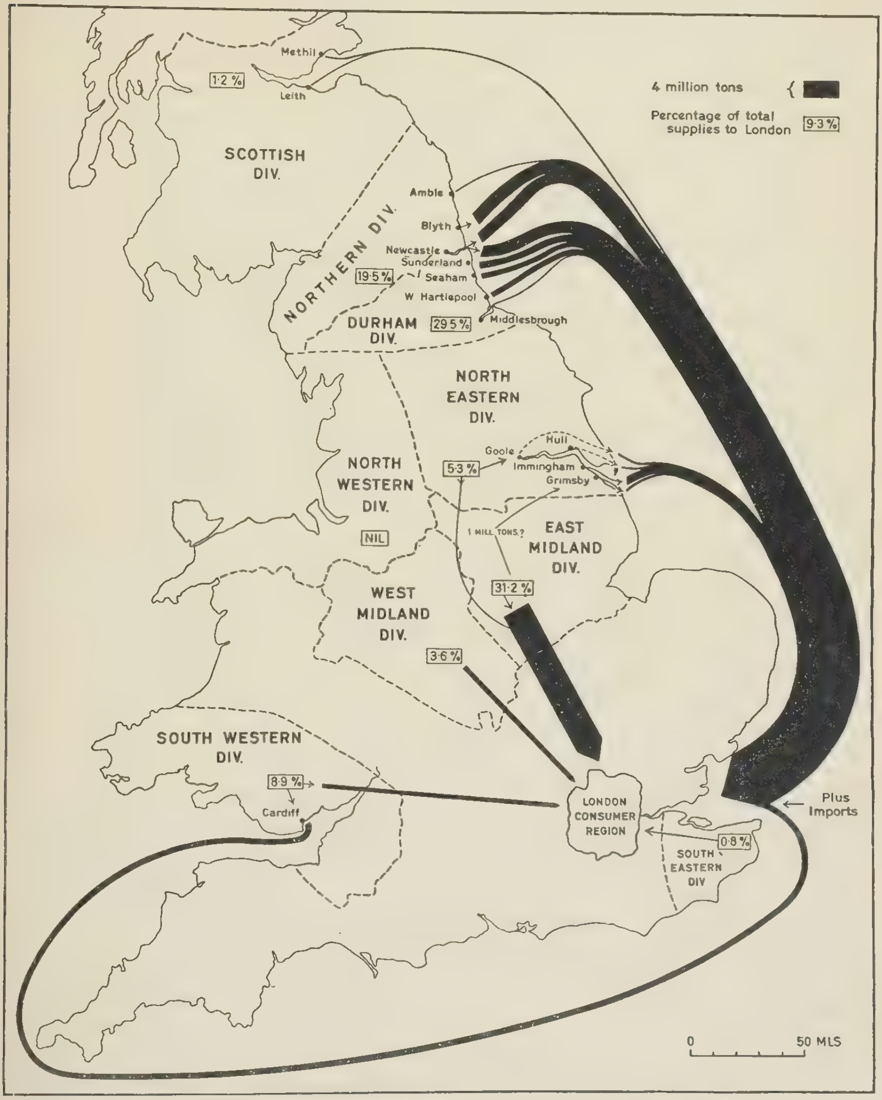

Fig. 3.—Average annual flow of coal to London 1952–4.

The question of the area of effectiveness of sea transport economies is therefore a complex one, depending upon a number of variables. Apart from cost considerations, the type of coal required and its availability will be important factors. It is perhaps pertinent to note that the supply of coal by rail has sometimes been erratic and unreliable, wagons have not been available or the number of shunts in major sidings has been restricted. But new rolling stock will be available in the future and the new railway freight charges scheme (under the Transport Act of 1953) may well improve the competitive position of the railways.

It seems clear that at the present time seaborne coal has substantial economies to offer waterside consumers and certain inland consumers. These inland consumers are mainly located in a segment of our London region which penetrates the area like a wedge from the east. That part of the wedge to the north of the Thames would run approximately from Dagenham north to Chigwell and southwest to Acton. The part of the wedge to the south of the river would be bounded approximately by a line drawn from Erith southwards to Bromley and northwest to Southwark. These approximations are made with reference to normal forms of secondary transport used. It must be emphasized again that *quality* and *availability* play a major part, and that seaborne coal is undoubtedly consumed in quantity outside of the suggested segment, while railborne coal is consumed within it. The chief group of seaborne coal consumers is that along the waterside, and this group includes the major users of coal in London—the public utilities. Railed coal cannot compete here and thus the total seaborne tonnage to London regularly exceeds railborne quantities and usually amounts to about 65 or 70 per cent of the total home-produced supplies. Coal is still the greatest single commodity by weight coming into the London river, as it was when Rodwell Jones wrote his *Geography of London River* in 1931.[10] For inland factories, domestic and miscellaneous users of raw coal lying beyond the restricted reach of seaborne economies, however, or for those uses in which seaborne coal is unsuitable, railed coal is preferable provided that the supply system is functioning smoothly. From some coalfields, of course, the railways would be the only economical method of transport (e.g., the West Midlands), but from others a choice is possible and here the considerations outlined above will play their part.

The use of the motor lorry as a transport medium has not been analysed here. Over the country as a whole the movement of coal by road has been increasing, but the most economic distance is up to about 30 miles and, though coal lorries do travel as far as about 150 miles on occasion, London is in general too distant from major coalfields for this form of transport to be significant at the present time. As a secondary form of transport, however, the use of road haulage is growing, but this is a part of the internal pattern of coal movement in London.

Fig. 3 shows the sources, supply routes and loading ports for London's coal supplies at the present time. The quantity of East Midlands coal using the sea route has been growing in recent years; for the period represented on the map the quantity has been calculated at about 1 million tons—an approximation based on the evidence of available data. Most Yorkshire coal uses the sea route, but small quantities are moved in by rail.

One of the most important features of the present day London coal trade is the steadily increasing contribution from the East Midlands. This is applicable to the coal-deficient areas generally for, whereas in 1948 the East Midlands met 28 per cent of the coal requirements of the regions south of the Severn–Nen line, in 1954 it supplied 35 per cent of the total. Since 1954 the importance of this Division has increased still further. Comparable statistics are not available but it is clear, for example, that the decline of foreign coal imports into London has been made up by increased supplies (both seaborne and railborne) from the East Midlands and the indications are that well over half of London's power-station coal now originates there. In the supply of increasing quantities to the deficient areas from this division, the relative economies to be gained by various transport forms available become of great significance.[11]

The future of coal movement to the deficient regions is a question of some uncertainty. What are likely to be the effects of developments in the field of nuclear energy? Much will depend upon the types of coal supplied. Clearly the East Midlands, supplying large quantities of power-station coal, will be most affected. Fig. 2 shows the main consuming classes in London and the origin of supplies in each class. From this the reader may himself make some estimate of possible future trends—and consequent effects on interests involved—in the London coal trade.

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Crop-Association Regions in East Pakistan

B. L. C. JOHNSON

THE DISASTROUS FAMINE of 1943 awakened the Government of the then undivided Bengal to a realization of its ignorance concerning the state of agriculture in the province, and the long overdue task of assembling accurate agricultural data was then begun. The results of the unique survey that followed are contained in H.M. Ishaque's *Agricultural Statistics by Plot to Plot Enumeration in Bengal*, 1944 *and* 1945 (Alipore, 1947), which will probably remain for many years the yardstick against which officials of the East Pakistan Agricultural Department will measure current crop acreages by "eye-estimate". The survey was remarkably detailed and gave data covering the three major rice crops, wheat, barley and maize, three oilseed crops, six pulses and eight other field crops; in addition it detailed six "orchard" crops and the area under cultivated bamboo and private woodland. Land "not available for cultivation" was described under five heads, and land "culturable but not yet cultivated" under six.

Since partition, published agricultural statistics have been available for East Pakistan by district totals only. The *Plot to Plot Enumeration* of 1944–5, however, provided information down to the level of the *Union*, an administrative unit comprising a number of *mouzas*, the latter more or less equivalent to village areas. For the present study the next larger unit to the Union in the administrative hierarchy, the *thana* (police station), was considered the smallest that could be mapped over the whole province. There are 429 thanas in East Pakistan, averaging in size about 85,000 acres in the plains districts.

The Chittagong Hill Tracts were omitted from the enumeration owing to the non-availability of printed cadastral survey maps for this district, and possibly also to military operations in the area at the time. Nor was the Sylhet district included, being then a part of the Province of Assam. The omission of the Chittagong Hill Tracts does not seriously affect the present study, as the district differs very markedly from the rest of East Pakistan and contains less than one per cent of the cultivated area; thana figures here would be almost as difficult to interpret as the district totals which are available for the post-war period. Permanently cultivated land in the Hill Tracts is scattered along valley floors and, areally, is less important than shifting

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cultivation (*jhum*) on the slopes. In the district statistics it is not possible to distinguish the areas involved in either type of cultivation, but their qualitative make-up is discussed below. The absence of data for Sylhet has in part been made good by direct application to the district headquarters, though the figures cannot compare in accuracy or completeness with those available for pre-partition Bengal. They serve the present purpose well enough however, enabling an overall view to be obtained of the distribution of the main crops of East Pakistan.

Using the statistical information described above, this paper sets out to determine crop-association regions, which are then used as a basis for distinguishing more generalized agricultural regions. Before embarking on this, however, it may be helpful to sketch briefly the range of physiographic and climatic conditions within which agriculture in the delta must be carried on.

The fundamental factor permitting or prohibiting cultivation is water—groundwater, floodwater, or rainwater. In its simplest terms the relief of the delta can be described as being made up of an infinite number of basins, each contained within a rim of "high" level land, where the coarsest sediments are found, and having at its centre a "back swamp depression" of heavy clay soils. Between these extremes lies a variable proportion of land of "middling" height and soil texture. Mention should also be made of the slightly more elevated clay lands of the Barind and Madhupur terraces of "old alluvium", where soils are difficult to work in the dry season, and of the *char* lands, low sandy islands and shoals which appear in river beds at low water seasons when they may be cultivated.

In Bengal the agricultural year is divided into three parts: the *rabi*, or dry season; the *bhadoi*, or rainy season, which corresponds most closely with the *kharif* season of northern India and West Pakistan; and the *hemantic* season, the principal cropping season of East Pakistan, extending from the latter part of the rains into the cool dry season. Some lack of clarity in the meaning of these terms arises from the official practice of giving the cropping seasons designations which refer to the times of harvest.[1] Thus rabi crops are called "summer crops" although their growing period is in large part in the cool dry season: similarly a fair proportion of the growing period of bhadoi crops comes before the rainy season properly speaking; and the hemantic crop, *aman* paddy, is called a "cold weather" crop as it is harvested at the beginning of the cool dry season, notwithstanding its having been in the ground probably most of the rainy season. These three divisions are further defined below:

(i) The rabi season lasts from October to March or April, during which rainfall is slight and most unreliable, being derived in the early part of the season from shallow depressions, though from March more violent nor'westers may bring short, heavy but localized downpours. It would seem that rabi crops rely mainly on moisture remaining in the soil after the monsoon rains, or upon irrigation from rivers and shallow lakes which are liable to dry up progressively before the onset of the spring rains. Coarser textured soils are generally favoured for non-irrigated rabi crops because of their water-holding capabilities, while *boro* paddy is grown on low (and therefore generally heavy) land close to sources of irrigation water. It is possible that dew, although an unreliable source of moisture, may be significant to the survival of

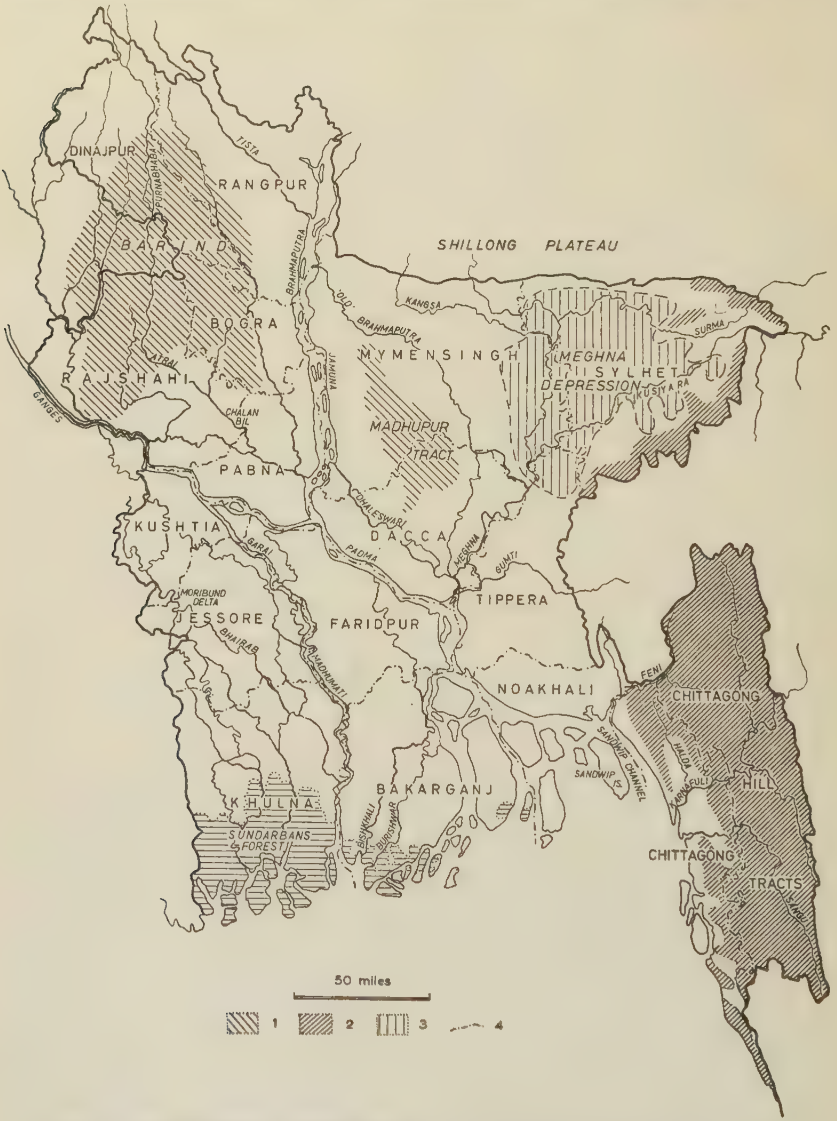

Fig. 1.—East Pakistan, physical features and administrative districts. 1, "Old alluvium" of Barind and Madhupur Tract; 2, hilly areas mainly under forest and bamboo jungle, with some tea gardens and *jhum* cultivation; 3, Meghna depression; 4, District boundaries.

crops during the dry season. Blanford records heavy dew in the Assam Valley and frequent cool season fogs along the rivers and low ground about Calcutta;[2] the present writer recollects waking in the Chittagong Hill Tracts to what sounded like a light rain on the trees, but which proved to be the dripping of heavy dew condensed from a dank fog by the large leaves of teak trees.

(ii) The bhadoi season lasts from April to August. The main crops, *aus* paddy and jute, depend on the light early rains to facilitate ploughing and germination, but excessive rainfall or flooding is harmful to young jute and may kill aus paddy. Light soils on levees are most favoured for these crops which also extend on to some middling land, as both areas can usually be ploughed before the rains and are least subject to early flooding. The varieties of rice grouped under the general term "aus" are quicker germinating, require a shorter growing season, and are less sensitive to dry spells than aman paddy. The yield per acre for aus is usually slightly lower than for aman, and considerably lower than for boro varieties, but in quality aus holds an intermediate position. Where both aus and aman are grown, the former will normally be consumed by the farmer's family, and as much as possible of the aman will be held over for sale, because of the higher price its finer quality commands. By contrast, boro paddy is of little commercial importance because of its coarseness.

(iii) The hemantic season (sometimes referred to simply as the aman season, after its principal crop) lasts from June until after November, overlapping the bhadoi and rabi seasons to some extent. Aman fields are often ploughed during the bhadoi season and may not be cleared of their harvest until well on into the rabi season.

The basis for differentiation of the crop-association regions is the relative importance in the total agricultural picture of the three main crops, namely, aman paddy, aus paddy, and jute, together with a fourth group, dry rabi crops, comprising the chief cool season crops occupying the more elevated lands in the delta. These four categories of crops are characteristic of different conditions of growth. A fifth crop, boro paddy, is taken into account in distinguishing one major region where it completely dominates the scene, although elsewhere it is rarely of any significance.

In order to give the maximum objectivity to the determination of the crop-association regions, a five-fold scale of levels of relative importance was calculated for each crop, using as the mean point in the scale the percentage of the total of cultivated land occupied by the crop in East Pakistan as a whole. These data are shown in Table I.

Aman paddy (Fig. 2), the main rice crop of East Pakistan, is more tolerant of flooded conditions than either the aus or the boro varieties. It is generally transplanted from seed beds to the growing position on lower ground about the beginning of the monsoon rains, by which time the pre-monsoon showers have sufficiently softened the clays, baked hard during the preceding dry months, to permit their being repeatedly ploughed and harrowed. Once the monsoon breaks there is always the risk of flooding, but unless aman suffers sudden and prolonged inundation, it can keep pace with rising water. Aman is least important, therefore, in high-lying areas such as the Madhupur Tract of "old alluvium" north of Dacca, and the mid-western parts of the delta in Kushtia and Jessore, i.e., the "moribund delta" as defined by Spate,[3] and the adjacent levees of the Ganges in Rajshahi (Fig. 1). On the other hand it cannot survive in the most deeply flooded areas such as the heart of the Meghna depression. It reaches its greatest importance, in places 100 per cent of the net cultivated area, in the shallower depressions of eastern Sylhet and in parts of the Barind in the northwest, where the heavy clay soils bake too hard to be cultivable at any other season,* and in a continuous seaward cultivated belt from Khulna eastwards through Bakarganj, Noakhali, Tippera and Chittagong.

TABLE I

Crop	Mean value	Level of importance				
		Very High	*High*	*Medium*	*Low*	*Very Low*
Aman paddy	67 per cent	⩾88	87–74	73–53	52–26	⩽25
Aus paddy	25 ,, ,,	⩾58	57–36	35–20	19–10	⩽ 9
Dry rabi crops	15 ,, ,,	⩾57	56–29	28–12	11– 6	⩽ 5
Jute	9 ,, ,,	⩾24	23–14	13– 8	7– 4	⩽ 3
Boro paddy	3½ ,, ,,	⩾60	59–22	21– 3	2	⩽ 1

Note:—The scale is calculated by dividing the range between the mean value and the maximum recorded percentage, in the ratio 1:2:2 upwards, and similarly for the lower end of the scale. Due to double cropping on some land the figures in the column of "mean values" total over 120 per cent.

By contrast aus paddy (Fig. 3) is grown on higher ground where soils are generally of coarser texture than in the depressions. For at least half of its growing period it depends on pre-monsoon rainfall (March-May), and so its fields have to be prepared during the dry season, a fact which helps to explain its unpopularity on heavier soils. In any case the inability of the crop to withstand much flooding excludes it from low ground. Aus therefore reaches its greatest importance in the areas of more sandy alluvium brought down by the Brahmaputra—both Old and New (Jamuna)—and Tista rivers, but it also dominates the moribund delta and the Ganges levees in the west. In the double-rice cropping region extending from Tippera into the mid-Chittagong coastal plain, it is also important, but in areas of early summer salinity (e.g., Khulna), on heavy clays (e.g., the Barind) or where depressions dominate the landscape and where serious flooding occurs (as in the middle Padma), the crop is of little significance.

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* In the Barind the "old alluvium" is less deeply dissected than in the Madhupur Tract, and a larger proportion of the area is available for aman cultivation. Much of the low ground in the Madhupur Tract floods too deeply for aman, and is used in the dry season for boro.

Jute (Fig. 4) shares with aus the bhadoi growing season in the early part of the rains, and to some extent competes with it for land, some varieties of jute also being intolerant of waterlogged conditions. On the whole, however, jute can be grown on moderately low ground provided flood water is not too deep to prevent harvesting. As a crop demanding rich soil it reaches its highest concentration along the flood plains of the active rivers, which carry an abundance of plant nutrients in solution. It is most important, therefore, in the belts regularly flooded by the Jamuna-Padma system and on the plain of the Old Brahmaputra continuing into the lower Meghna.

When compared with the maps of the staple food crops, aman and aus paddy, the distribution map of jute shows only a relatively small area in which the crop reaches a medium level of importance. Over extensive areas little or no jute is grown. Its insignificance in the seaward parts of the delta may be explained in the west by salinity, combining with the relative infertility of lands watered by floods originating locally, and in the east by the depth of flooding experienced when active rivers come into spate. In Sylhet, eastern Noakhali and Chittagong the only common factor which might account for the lowly position of jute is the absence of rivers loaded with silt and solubles to replenish the fertility of the land, but this explanation is not entirely satisfactory. Noakhali and the northern part of Chittagong support some of the most intensive cropping in East Pakistan (see Fig. 9), and the presence of high densities of food-seeking population would seem to be a factor as important as any in reducing jute acreages. The same reasoning cannot be applied to Sylhet and the Cox's Bazar Sub-division of Chittagong District where both cropping intensity and population density are relatively low.

The dry rabi crops and boro paddy occupy land between November and April. They do not compete for land however, the dry crops, such as wheat, pulses, and vegetables, preferring high-lying, light, easily worked soils, while boro paddy must be grown on low wet land close to sources of irrigation water in rivers or *bils* (shallow lakes). The most noticeable concentration of dry rabi crop cultivation (Fig. 5) is in the mid-western districts already mentioned close to the border with West Bengal. Heavy soil areas, even though relatively elevated, like the Madhupur Tract and the Barind old alluvial terraces, are avoided for the most part, as are depressions and any areas affected by increasing salinity through the dry season.

Boro paddy (Fig. 6) comes into its own in the heart of the Meghna depression in western Sylhet and eastern Mymensingh, a region in parts of which summer flooding is so severe that aus and aman cannot be grown and boro becomes the staple food crop. Outside this region, boro reaches a medium level of importance in a few thanas in southern

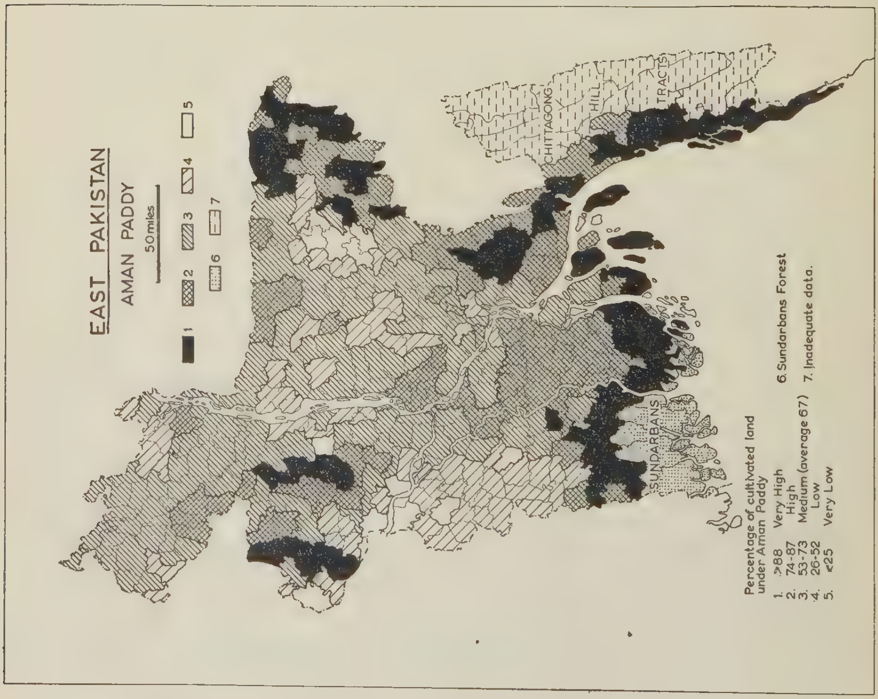
EAST PAKISTAN
AMAN PADDY
50 miles
1
2
3
4
5
6
7
CHITTAGONG
HILL
TRACTS
SUNDARBANS
Percentage of cultivated land under Aman Paddy
1. >88 Very High
2. 74-87 High
3. 53-73 Medium (average 67)
4. 26-52 Low
5. <25 Very Low
6. Sundarbans Forest
7. Inadequate data.

Fig. 2.

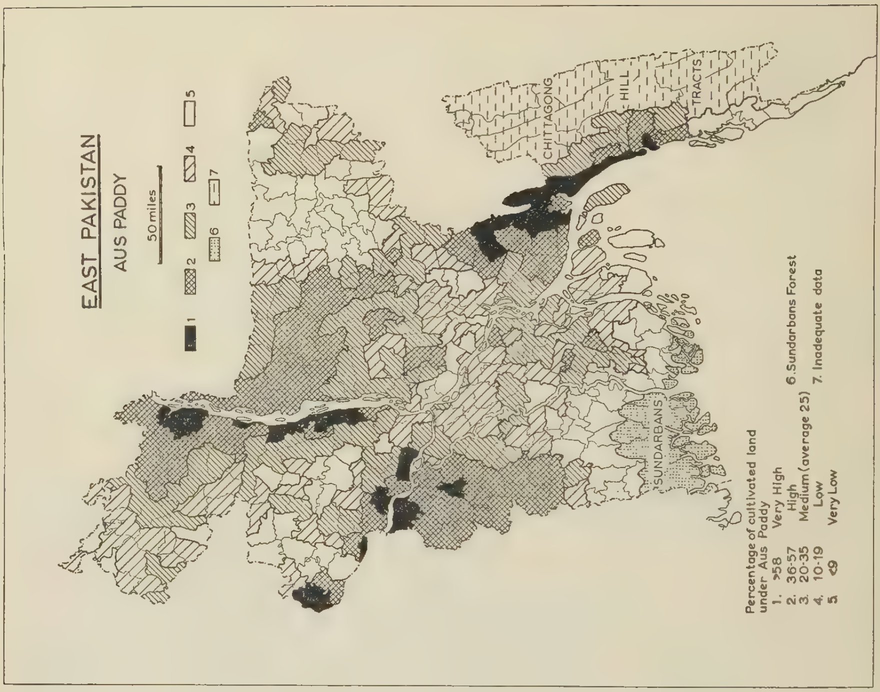
EAST PAKISTAN
AUS PADDY
50 miles
1
2
3
4
5
6
7
CHITTAGONG
HILL
TRACTS
SUNDARBANS
Percentage of cultivated land under Aus Paddy
1. >58 Very High
2. 36-57 High
3. 20-35 Medium (average 25)
4. 10-19 Low
5 <9 Very Low
6. Sundarbans Forest
7. Inadequate data

Fig. 3.

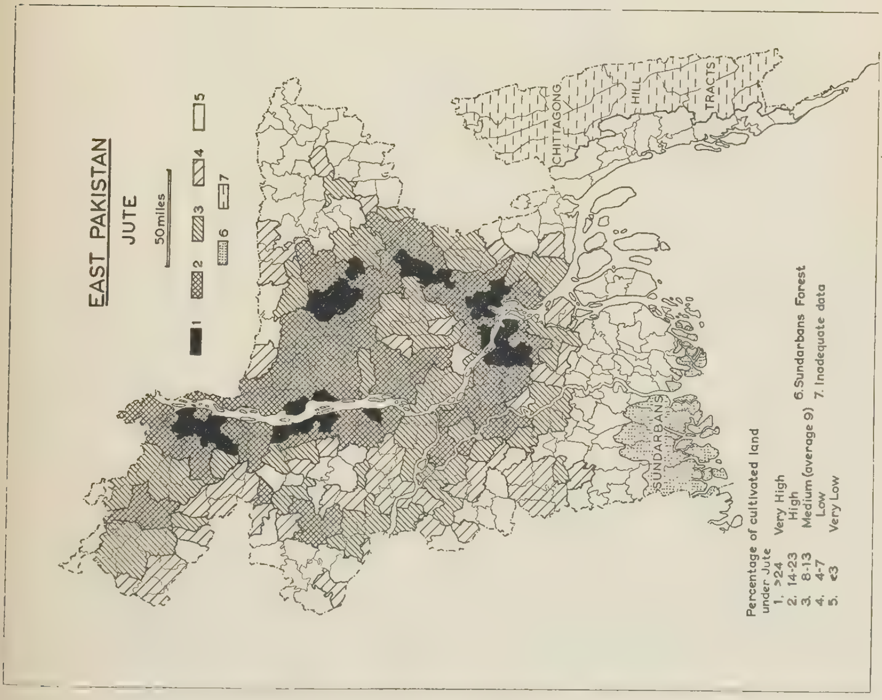
EAST PAKISTAN
JUTE
50miles
1
2
3
4
5
6
7
CHITTAGONG
HILL
TRACTS
SUNDARBANS
Percentage of cultivated land under Jute
1. >24 Very High
2. 14-23 High
3. 8-13 Medium (average 9)
4. 4-7 Low
5. <3 Very Low
6. Sundarbans Forest
7. Inadequate data

Fig. 4.

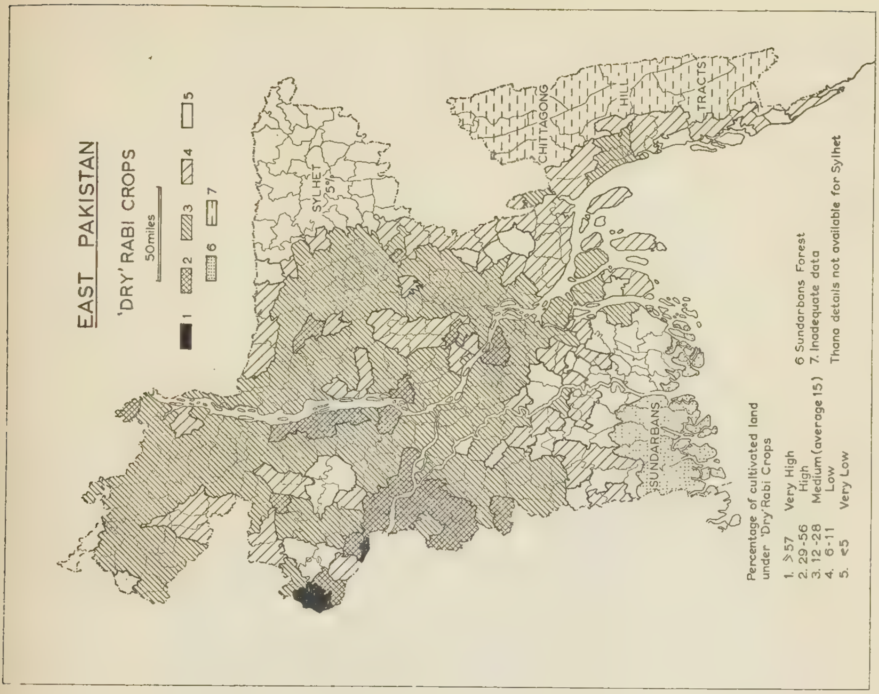
EAST PAKISTAN
'DRY' RABI CROPS
50miles
1
2
3
4
5
6
7
SYLHET
5%
CHITTAGONG
HILL
TRACTS
SUNDARBANS
Percentage of cultivated land under 'Dry' Rabi Crops
1. >57 Very High
2. 29-56 High
3. 12-28 Medium (average 15)
4. 6-11 Low
5. <5 Very Low
6 Sundarbans Forest
7. Inadequate data
Thana details not available for Sylhet

Fig. 5.

Dacca, and in two in western Rajshahi, but over more than half the Province it is of no significance at all.

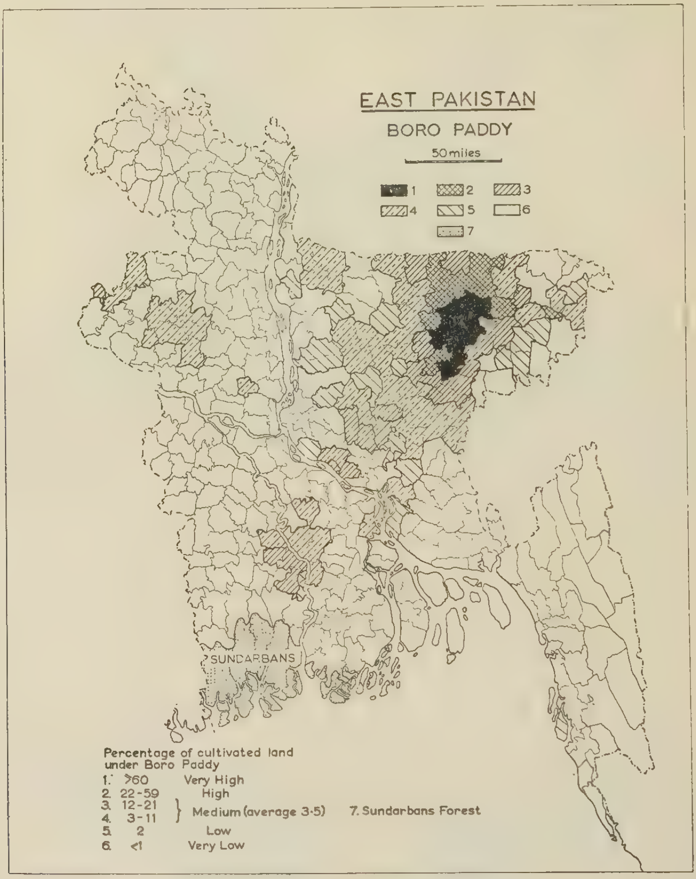

Fig. 6.

CROP ASSOCIATIONS

In drawing up the crop-association regions (Fig. 8 and appendix) six distinctive forms of association were found to occur. As these have characteristic regional connotations they have been given appropriate names. With the addition of the Sylhet Tea Gardens and the Chittagong Hill Tracts they form the basis of the map of simplified agricultural regions (Fig. 7).

1. Aus–dry rabi crop type; Mid-Western region.
2. Aus–jute type; Brahmaputra region.
3. Aman type, having four district regional sub-types: the Saline Delta region, South Chittagong, East Sylhet and the Northwest.
4. Aman–jute type: Padma region.
5. Boro type: Meghna Depression region.
6. Aman–aus, double-rice type: South-East region.

It will be noted that while aman and boro stand as monocultures in some areas, aus, jute, or dry rabi crops never do. This is understandable enough in the case of the last two, which occupy only minor positions in the agricultural scheme as a whole and, furthermore, are respectively an industrial fibre and a group of non-staple foods (plus tobacco) in an economy where subsistence is the farmer's first aim. One would have conceived it possible that aus might attain to a monocultural level

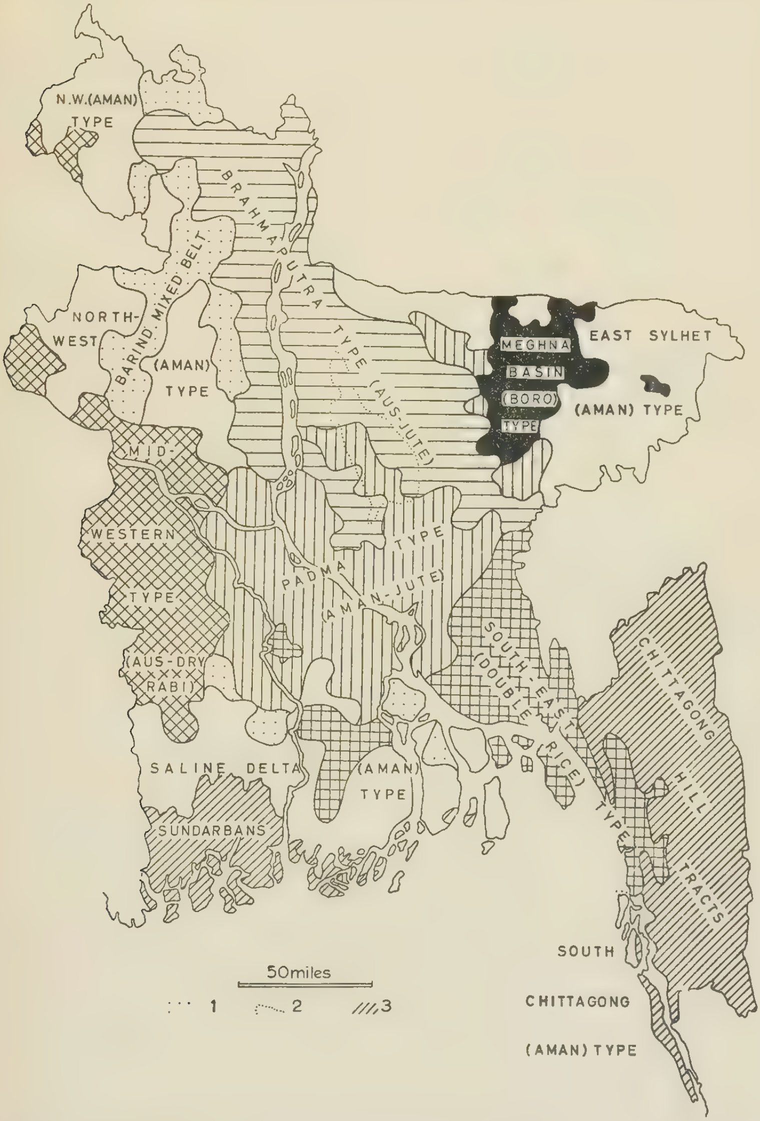

Fig. 7.—East Pakistan, generalized crop-association regions. 1, Indeterminate or transitional areas; 2, approximate limits of Madhupur Tract; 3, forests of Sundarbans and Chittagong Hills.

in some thana or other, but this is never the case. Aus, of course, generally shares with jute and dry rabi crops a similar agricultural environment, whereas aman and boro alone among the crops under consideration are able to survive conditions in their respective seasons inimical to the rest.

To have created a separate sub-type for every combination of crops at each scale of importance would have produced an unmanageable number of variants. It has been necessary to group together thanas which, while not having the identical levels of importance for each of the crop groups, diverge only one "degree of importance" on the five-fold scale shown on page 90 above. One thus arrives at a sub-type such as 1e or 2a as shown in the appendix. Sometimes (but never in the case of a crop the importance of which is a criterion for the classification of the sub-type under one of the six main categories of crop-association), there may be one crop with three *adjacent* values on the scale of importance, as in the case of sub-types 1a and 1b. In the case of five of the 29 sub-types such latitude has been extended to two of the crops, e.g., sub-type 3c, but in every such instance the extension has been made in order to incorporate, into a larger adjoining unit, one or two thanas for which the creation of a separate sub-type seemed unjustifiable, and never has the exception involved any of the crops on the basis of which the area is included in a regional type.

An area in which no crop rises above medium to low levels of importance presents some difficulty in deciding into which major type-region it should be put, as there might be two or even three alternatives. In such a case a "rule of contiguity" has been applied, and the area is included under the adjoining or nearest major region to which its characteristics would fit it. A few thanas of indeterminate character have been dealt with in this way.

The *Plot to Plot Enumeration* includes privately owned woodland under the heading of cultivated area. Rarely does this amount to a significant percentage but in parts of Chittagong District and in the Madhupur Jungle extending from Dacca into Mymensingh District, the apparent crop percentages are seriously reduced and the character of crop association obscured by the inclusion of such woodland in the total of cultivated land. Where this happens the crop ratios have been adjusted by excluding from the total "cultivated area", the area of woodland, and then calculating the ratios in relation to this smaller figure.

THE CROP-ASSOCIATION TYPE REGIONS

In following these brief descriptions, the reader is reminded that the scale of importance of each crop is calculated relative to the percentage of the net total of cultivated land it occupies in East Pakistan. Where for example jute attains a higher level of importance than aman paddy, it will none the less, almost invariably occupy a smaller area. The notations in parentheses refer to the appendix and Fig. 8.

1. In the *Mid-Western aus–dry rabi* crop type, aman never exceeds medium importance, and jute is always secondary to aus. The most extreme version of this type (1a) occupies the Ganges levees in Rajshahi and Kushtia and extends into the moribund delta with decreasing intensity of cropping further south (1b) in Jessore. North of the broad levee of the Ganges (1c) aus is reduced as aman increases on lower ground. The remaining areas (1d and 1e) are generally of low cropping intensity and in parts indeterminate character.

2. The *Brahmaputra aus–jute* type is associated with the sandier alluvium brought down from the eastern Himalayas by the Brahmaputra–Jamuna system and the Tista river. At its most typical (2a), it extends along the flood plains of the Jamuna and into the Dhaleswari basin in southern Dacca, and along the plain of the middle Old Brahmaputra. At the mouth of the Tista (2b) lower ground allows aman to displace dry rabi crops in third place. In the middle Tista (2c) and other areas marginal to 2a, a less intensive type is found in which either of the bhadoi crops, aus or jute, but not both, reaches high levels of importance. A similar but still less intensive variant (2d) occurs in a few thanas bordering the latter sub-type.

3. *Aman dominant* types are due to a variety of causes:

(i) Salinity, increasing in severity through the dry season until the beginning of the effective rains in May, restricts crops other than aman (which is grown after the rains have flushed salt from the soil) in parts of Khulna District, and the immediate coastal strip in southern Chittagong.

(ii) Some low-lying areas unaffected by salinity (e.g., Chalan Bil in eastern Rajshahi-Pabna) can grow little else besides aman because of the waterlogged condition of the soil even in the dry season, though the damp-tolerant pulse, *khesari*, may be broadcast on such ground shortly before the aman harvest.

(iii) In other areas aman seems to dominate through lack of population pressure to compel a more diverse cropping pattern. It is the preferred paddy crop, other things being equal, for it tolerates flooding better than aus, and generally gives better yields. This seems the most probable explanation of its dominance in much of southern Chittagong, eastern Sylhet and parts of Dinajpur.

Aman cultivation most closely approaches monoculture in type 3a, in Khulna and southern Bakarganj (the Saline Delta), South Chittagong and the Purnabhaba River lowlands and western Barind of Rajshahi. At the mouth of the Padma (3b) dry rabi crops reach a medium level of importance, probably on account of the fresher groundwater in this part of the delta where the discharge of the rivers is sufficient at all times of the year to prevent backflow of sea water on a serious scale. In north-western districts this sub-type occurs on the raised margins of major depressions, or where the clay soils of the Barind are overlain by sandy alluvium,* situations which in either case permit some rabi cropping.

A less extreme version of 3a, in which some bhadoi crops relieve the monotony, is found in the Atrai River–Chalan Bil depression (3c) and in the less swampy parts of east Sylhet. A variant of 3a/3c in relatively poorly developed areas in Dinajpur (3d) corresponds in intensity, though not in quality, to the aus–dry rabi crop areas adjacent to it. With a rather higher level of agricultural activity, 3e resembles 3c but with aman less important, while in the Padma estuary the sub-type is transitional between the monocultural saline delta (3a) and the highly polycultural areas to the north (4b). It is also extensively represented in Dinajpur, where it alternates with the somewhat similar 3d.

In a belt along the Surma and Kusiyara rivers in Sylhet (3f) fringing the main boro region (5) aman remains dominant, and of the other crops only boro consistently rises to medium levels of importance. At the foot of the Shillong Plateau in Mymensingh (3g) is a zone with a low cropping intensity, transitional to the adjacent aus–jute and aman–jute regions. A somewhat similar indeterminate type (3h) to which however boro at a medium level gives some distinction, is represented by three thanas on the fringe of the Madhupur Tract in southern Dacca, and three bordering the Barind in western Rajshahi, in all of which low to very low levels of intensity of cropping are recorded (Fig. 9).

4. The *Padma aman–jute* type characterizes the centre of East Pakistan, the rich middle Padma plain which receives regular supplies of flood water from the united Ganges-Jamuna. The depth of flood water and the preference for a cash crop on rich soils account for the relative dominance of jute over aus paddy as a bhadoi crop.

The main development of this type (4a) lies south of the Padma in Faridpur District, and north of it in the lower Meghna Basin centring on the jute collecting river port of Narayanganj. Jute is less important towards the margins (4b) of these areas, salinity being a major factor towards the south. In a few thanas (4c), the roles of jute and aman are reversed and the result is a less intensive but still predominantly cash-cropping version of 4a. The poorest development of the aman–jute type is found significantly in the "old alluvial" areas of the Barind and the Madhupur Tract, where cropping intensity is very low.

5. The *Meghna Basin boro* type presents fewest problems of definition. Boro paddy is everywhere at a very high to high level of importance, and the type region is subdivided on the criteria of other crops. What amount to monocultural conditions occur in the low central parts of the depression (5a) which remain deeply flooded from May to November, and where the percentage of cultivated land under boro

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* Prior to its change of course in 1787, the Tista flowed south across the Barind. The sands it deposited (as yet unmapped) probably help to account for the variegated agricultural pattern of parts of the area as brought out by the present study (cf. Figs. 7 and 8).

exceeds 80 in places. To the south and west (5b) while early summer flooding is sufficient to discourage aus cultivation, jute reaches high to medium levels, as it gives a better prospect of a harvest under such conditions. Aman is unimportant due to the depth of flooding once the rains set in, but the medium level reached by dry rabi crops indicates that a reasonably large area on the levees dries out soon enough for crops of vegetables, pulses and tobacco to be taken during the cool season. To the north of the basin (5c) the rapidity with which flood waters descend from the Shillong Plateau is reflected in the insignificance of bhadoi crops, but the fact that aman reaches medium importance shows really deep inundation to be less extensive than in the remainder of the Meghna depression.

6. The *South East double-rice* (*aman–aus*) *region.* East of the lower Meghna there occurs a remarkably abrupt diminution in the importance of jute and a corresponding increase in aman and aus, with the latter generally taking second place.

In a belt parallel to the Meghna (6a), jute persists at high to medium levels, but is left behind farther east (6b) where clay-loam soils and the intensity of aus–aman cropping militate against dry rabi crops, and one has the double-rice cropping region par excellence. Only in response to urban demand near Chittagong (6c) where also hill streams bring down sandier deposits, does dry rabi cropping become significant. It may be noted however that *khesari* occupies from 12–20 per cent of the cultivated area of the coastal plain of north Chittagong and Noakhali during the rabi season. Less intensive versions of these types, in which aus diminishes in importance, occur in Sandwip Island and north central Bakarganj (6d), but could equally be regarded as diversified variants of aman monoculture (3a) in the neighbouring saline delta, supported here by the fresh water flowing in the easterly distributaries of the Padma, such as the Burishwar and Bishkhali. Inland from Chittagong (6e) conditions are transitional to those of the monocultural south of the same district (3a).

The Chittagong Hill Tracts and the Tea Estates of Sylhet District cannot be treated in the same way as the rest of East Pakistan for statistical reasons already mentioned, but the general characteristics of their agriculture can be summarized from the writer's field observations.

Two types of agriculture are practised in the *Chittagong Hill Tracts.* The hill slopes support jhum cultivation, a form of shifting cultivation, in which slopes cleared of bamboo jungle by cutting and burning during the dry season are planted with mixed crops (hill rice, maize, cotton, vegetables) at the beginning of the rains, and allowed to revert to bamboo for periods upwards of three years at the end of a single season's "cultivation". The flat valley floors are under permanent cultivation, land being classified by the Settlement Officers as paddy land or *pounyma* land (suitable for dry season crops). The available statistics make no distinction between crops grown in permanent fields and those raised on jhum land, and so are incapable of reliable interpretation. A rough estimate, borne out by investigations in several parts

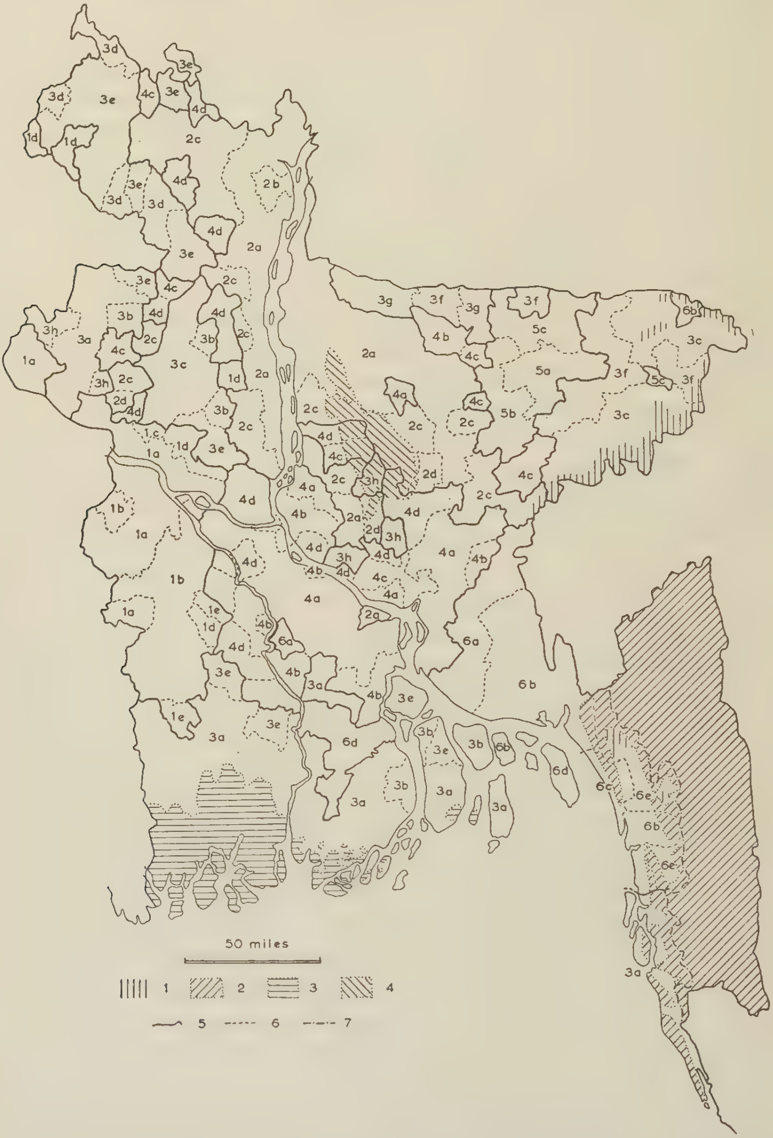

Fig. 8.—East Pakistan, crop-association regions. 1, Tea garden belt; 2, Chittagong hill forests and jungles; 3, Sundarbans forest; 4, Madhupur Tract; 5, boundaries of major crop-association types; 6, boundaries of sub-types; 7, District boundary of Chittagong Hill Tracts.

of the district, suggests that the permanent cultivation most resembles sub-region 1b in the foregoing classification: i.e.—aman: low; aus: very high; jute: very low; dry rabi crops: medium. As however some farmers have jhum land as well as permanent fields, it would be misleading to classify the area simply as an aus–dry rabi crop type.

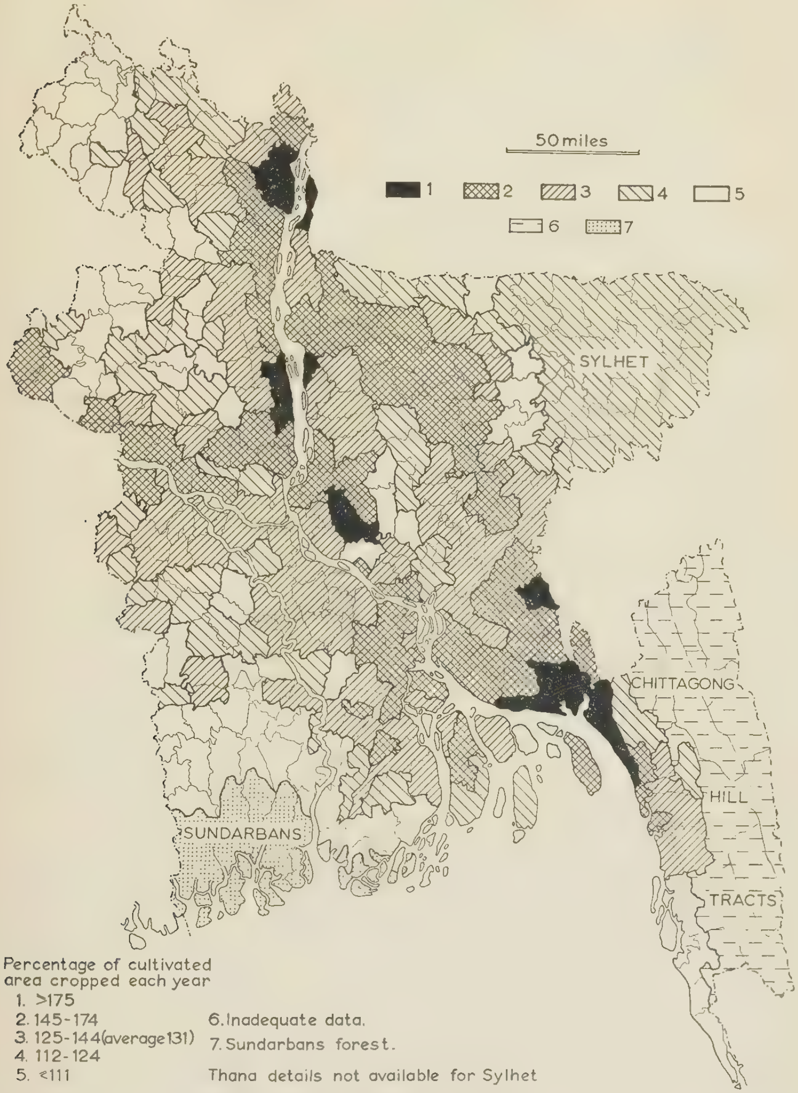

Fig. 9.—East Pakistan, cropping intensity.

In the *Tea Estates* (mainly in Sylhet but with outliers in Chittagong and the Hill Tracts) tea is grown on the plantation system, and does not as a rule compete for land with other crops. It is planted on the better-drained slopes and erosional terraces often only a few feet above the local base level in the Meghna Depression. Such terraces flank the hills of Tertiary sands and clays in southern and eastern Sylhet, and again in Chittagong District, and may eventually be correlated with the "older alluvium" of the Madhupur Tract and the Barind. The valley floors within the tea gardens are often given over to aman cultivation by tea garden families, and a small area of vegetable plots occurs round their settlements, but otherwise the estate lands are devoted to tea, coppiced bamboo and sun-grass (for thatching houses and covering seed-beds), or remain under secondary jungle (a source of firewood and timber for local use) awaiting development.

INTENSITY OF CULTIVATION

Here and there in the analysis of the crop-association regions, mention has been made of intensity of cultivation. It will be appreciated that the scheme of "levels of importance" of the various crops though well suited to assessing the *kind* of diversity of agricultural activity, is not a sound basis for measuring overall intensity of cultivation. Fig. 9 has been prepared therefore to supply this necessary complementary information. It incorporates all the crops surveyed in the *Plot to Plot Enumeration*, including orchards and bamboo spinnies, but excluding other woodland wherever distinguishable and of significant amount; a district total has been used for want of adequate thana details for Sylhet. Naturally there is some degree of correspondence between this map and that of generalized crop-association regions.

Crop-association type regions based on multiple criteria tend to correspond to areas of high intensity. The South-East double-rice crop region and the Brahmaputra aus–jute region are outstanding cases, while it is also true of large parts of the Mid-Western (aus–dry rabi crop) and Padma (aman–jute) regions. By contrast, where the tendency is towards the dominance of one crop, intensities seldom rise above low levels, and the areas of near monoculture of aman and boro paddy stand out clearly.

This map reinforces the importance of physical factors in East Pakistan's agriculture. Low intensity of cropping often indicates the regions of relative difficulty: the Barind and Madhupur Tracts of older, and therefore longer leached, alluvium, weathering to heavy clay soils; the excessively low areas, and those (as in the northwest "para-delta" and the moribund delta) remote from the influence of the wealth-giving floods of the Ganges and the Brahmaputra rivers.

The areas of medium to high intensity of cropping are obviously those where traditional methods have been most successful, but their productivity can be increased by improvements in agricultural techniques. Areas of lower intensity present a greater challenge, for here traditional methods have been able to make least headway, and here more than anywhere, progress will demand the skills of the scientific agronomist and engineer.

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[3] O. H. K. Spate, *India and Pakistan*, London, 1957, p. 525.

APPENDIX

Type	*Aman*	*Aus*	*Jute*	*Dry Rabi*	*Boro*
1a	LVL	VHH	MLvl	VHH	
1b	L	vhH	Mlvl	M	
1c	M	H	M	H	
1d	ML(vl)	M	LVL	M	
1e	L	M	L	LVL	
2a	ML	vhH	vhH	hM	
2b	H	VH	VH	L	
2c	ML	HM	HM	hMl	
2d	L	M	M	ML	
3a	VHH	LVL	VL	LVL	
3b	VHH	LVL	LVL	M	
3c	VHH	mLVL	mLVL	lVL	
3d	HM	LVL	L	LVL	
3e	HM	MLvl	MLvl	ML	
3f	VHH	mLVL	mLVL	LVL	M
3g	M	ML	ML	LVL	LVL
3h	ML	LVL	mlVL	ML	M
4a	HM	MLvl	VHH	hMl	
4b	vhH	MLVL	M	Mlvl	
4c	hML	LVL	VHH	ML	
4d	M	ML	M	(h)ML	
5a	LVL	VL	VL	LVL	VHH
5b	LVL	LVL	HM	M	VHH
5c	M	VL	LVL	LVL	VHH
6a	VHH	HM	HM	mLVL	
6b	VHH	VHH	LVL	(m)LVL	
6c	VH	VH	VL	M	
6d	VHH	HM	LVL	LVL	
6e	VHH	ML	VL	ML	

Note: The notation above refers to the level of importance as given in the table on p. 90. Thus: VH=very high; H=high; M=medium; L=low; and VL=very low.

Small letters indicate that a small proportion of the thanas in the sub-region concerned come into the category shown, and where the small letters are in brackets one thana only is at that level.

Lower Berg

A distinctive region between Rhine and Ruhr

T. H. ELKINS AND E. M. YATES

LIKE THE OLDER ENGLISH COUNTIES, the minor German states were not as a rule "natural" regions; their territorial extent depended rather upon the vigour and ability of their ruling families. Nevertheless they were for centuries divisions of great political and economic significance within Germany, and their names are still used in regional descriptions. One such unit is provided by the former Duchy of Berg. Counts of Berg first come to our attention in the eleventh century, with a small territory on the lower river Wupper, in the northern Rhenish Uplands. By war, by purchase and by marriage the boundaries of Berg were pushed to the Sieg to the south, the upper Wupper to the east, the Ruhr river in the north and the Rhine in the west, where Düsseldorf, subsequently the capital, was established as a fortress in 1288.

Berg finally disappeared as a political unit in the Napoleonic wars, but as *Das Bergische Land* remains a regional name. Following Schüttler[1] Berg may be divided into three sections: the predominantly rural Upper Berg stretching from the river Sieg to the lower Wupper; the highly industrialized Middle Berg, with the towns of Wuppertal, Solingen and Remscheid; and finally Lower Berg stretching northwards to the Ruhr river, the region with which this paper is specifically concerned (Fig. 1).

In Lower Berg human influences from the Rhine and from Westphalia overlap and mingle. This was so in the initial occupation of the land by Germanic peoples, in which Frankish settlement from west of the Rhine overlapped and largely obscured settlement of Saxon origin derived from Westphalia to the north and east. The same dual relationship holds good to-day, but with the industrialization of the Ruhr the pull to the north has become much stronger.[2] Lower Berg, in fact, provides an excellent example of the way in which modern Ruhr industry has spread its influence extensively over the upland country to the south. A study of this region also goes some way to correct the overgeneralized notion of the Rhenish Uplands as solely a thinly populated country of forested hills. Lastly, it provides an excellent example of the river terraces and surfaces of the Rhenish Uplands at a point where the proximity of the glacial deposits of the

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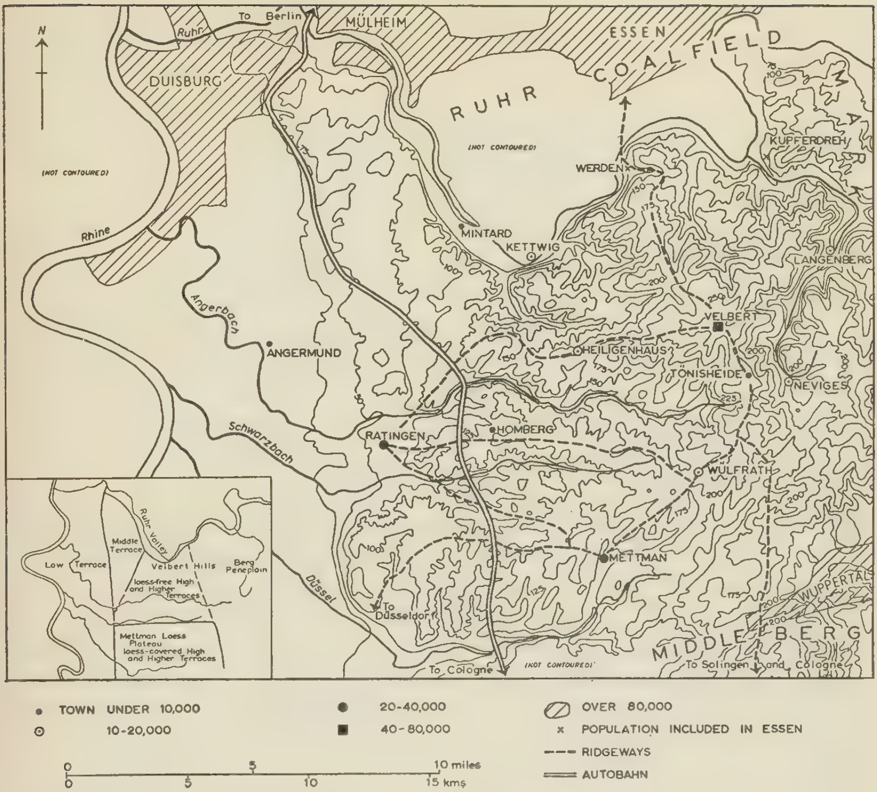

Fig. 1.—Relief, ridgeways and towns in Lower Berg. Contours are in metres, interval 25 metres.

North German Plain throws some light on the thorny problem of denudation chronology.

GEOLOGY

Lower Berg is bounded on the west and south by the Rhine and its tributary the Düssel-Bach, and on the north and east by the Ruhr and its tributary the Deil-Bach. Geologically the region has a broad fringe on the west and north, formed by the lower aggradational-terraces of the Rhine and Ruhr, and a core of resistant Devonian and Carboniferous rocks, part of the Rhenish Uplands. These rocks have been thrown into a series of pronounced folds, with axes showing ENE–WSW Hercynian trends. The most important are, from south to north, the Herzkamp syncline, the Velbert anticline, the Witten syncline and the Bochum syncline (see Fig. 2). The folding causes considerable repetition of the various outcrops, but in general the oldest rocks are in the south, and the synclines contain progressively younger rocks towards the north.

The Middle and Upper Devonian rocks which predominate in the south are extremely varied, including shales, conglomerates, sandstones and limestones. Of particular importance are the thick reef limestones (Massenkalk) which are present to the south of the Herzkamp syncline in the Düssel valley, and in a faulted belt along the Anger valley (Figs. 1, 2). They constitute an important mineral resource, and their outcrop is associated with a softening of the relief and with some of the better soils of the region. Northwards, Carboniferous rocks begin to appear in the synclines. At first they belong to the Dinantian, broadly equivalent in age to the Carboniferous Limestone Series of England, and they contain no workable coals. In the northern and eastern parts of the region, immediately to the south of the river Ruhr, appears the succeeding Namurian, which in England contains the Millstone Grit. This consists of alternating quartzites, sandstones and shales with a few thin semi-anthracitic coals. Structurally the succession of folds characteristic of Lower Berg is continued northwards without a break into the Ruhr coalfield, where the more profound Essen, Emscher and Lippe synclines contain not only Dinantian and Namurian but also the Westphalian, which provides the principal coal resources. In other words, Lower Berg contains a few thin hard-coal seams of the extreme southern fringe of the Ruhr field.

To complete the pattern of solid geology, mention must be made of the Oligocene sands which in places, especially in the west, overlie the bevelled Devonian and Carboniferous rocks. These sands are reminders of the penultimate marine transgression which affected the periphery of the Rhenish Uplands.*

All this complexity of structure and lithology has little effect on relief. Occasionally a ridge of lower Namurian quartzite rises above the general level, or a stream has adjusted its course to a band of shale. Morphologically, however, Lower Berg consists of a great staircase of surfaces, the higher members cut indifferently across Carboniferous, Devonian and Oligocene rocks[3] (see Fig. 3).

MORPHOLOGY

The Low Terrace of the Rhine, which in detail comprises two or possibly three separate terrace features at between 35 and 40 metres in altitude, is up to 7 kilometres wide on the right bank of the river. The much narrower flood plain is about five metres below the level of the terrace. The Low Terrace of the Ruhr, at about 40 to 45 metres, shows considerable variation in width, but is rarely much more than a kilometre wide. In contrast to that of the Rhine, the flood plain of the Ruhr does not reach far upstream, and the Low Terrace is therefore still functioning as a flood plain above Mintard. The two terraces have consequently offered quite different potentialities for settlement. The thick gravels of the Rhine Low Terrace, covered with surface material derived from loess and sand, and generally (although not always) above flood level, have a long history as the home of man. In contrast, even to-day, settlement along the Ruhr tends to be sited well back to the valley sides.

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* A further transgression took place in Miocene times.

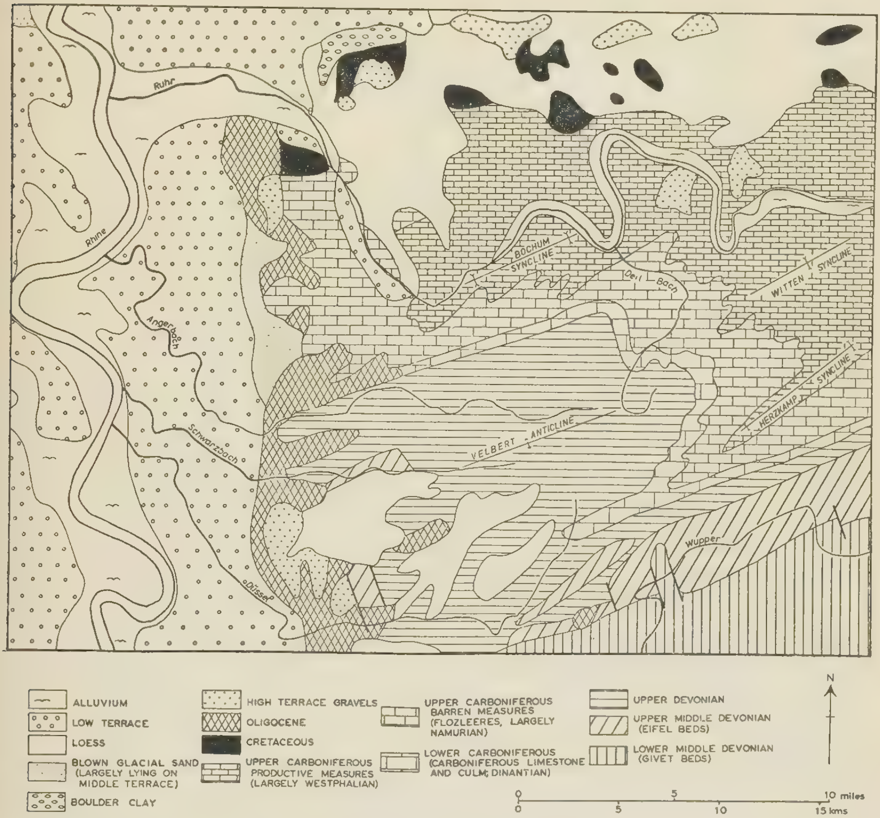
Ruhr
Rhine
Angerbach
Schwarzbach
Düssel
BOCHUM SYNCLINE
Deil Bach
WITTEN SYNCLINE
HERZKAMP SYNCLINE
VELBERT ANTICLINE
Wupper
ALLUVIUM
LOW TERRACE
LOESS
BLOWN GLACIAL SAND (LARGELY LYING ON MIDDLE TERRACE)
BOULDER CLAY
HIGH TERRACE GRAVELS
OLIGOCENE
CRETACEOUS
UPPER CARBONIFEROUS PRODUCTIVE MEASURES (LARGELY WESTPHALIAN)
UPPER CARBONIFEROUS BARREN MEASURES (FLOZLEERES, LARGELY NAMURIAN)
LOWER CARBONIFEROUS (CARBONIFEROUS LIMESTONE AND CULM; DINANTIAN)
UPPER DEVONIAN
UPPER MIDDLE DEVONIAN (EIFEL BEDS)
LOWER MIDDLE DEVONIAN (GIVET BEDS)
N
0 5 10 miles
0 5 10 15 kms

Fig. 2.—Geology of Lower Berg.

Above the Low Terrace, at altitudes of approximately 50 and 80 metres, is the composite Middle Terrace. This is fragmentary along the Ruhr but important in providing sites for many of the small towns of the valley. Along the Rhine it is more strongly developed, and comparable in width with the Low Terrace. A little south of Ratingen, the Middle Terrace is interrupted by the wooded Aaperwald, where the ground rises for some 60 metres directly from the Low to the High Terrace. The Middle Terrace along the Rhine is thickly covered with blown sand and almost completely wooded.

East of this broad forested belt there is a sequence of remnants of former terraces at intervals of approximately 20 metres from 100 to 200 metres. At the 100-metre level is the High Terrace of the Rhine and Ruhr.[4] It is one of the most important of the Rhine terraces and can be followed right through the Rhine gorge and up many of the tributary valleys. At heights from 120 to 200 metres are the Higher

Terraces of the Rhine (Fig. 3). They are all considered to be true terrace remnants, cut by the river, rather than parts of a complete peneplain with interfluve as well as valley flats. Their remarkable flatness supports this interpretation, although they have little gravel cover save for an occasional scatter of pebbles. Their soils are in consequence, with one major exception, derived from Devonian rocks and, apart from those of the limestone outcrops, are poor and stony.

The exception is the loess, which in the south covers a large part of the Higher Terraces. There are in reality two loess layers, one superimposed on the other, and the upper parts of both have suffered some decalcification. The combined thickness reaches up to 20 metres.

East of the Higher Terrace remnants the ground rises above 250 metres in the neighbourhood of Velbert, and constitutes part of the Berg peneplain into which the lower surfaces already described were cut. This higher ground around Velbert is separated from the extension of the peneplain farther east by the deeply incised Deil-Bach, and in fact forms a considerable ridge extending southwards from the margin of the Ruhr valley. It separates two quite distinctive drainage patterns; westwards from the ridge flow the Vogelsang-Bach to the Ruhr, and the Anger-Bach, Schwarz-Bach and Düssel-Bach to the Rhine. These small streams have cut deeply into the Higher and High Terraces, and divide the western part of Lower Berg (apart from the Low Terrace of the Rhine) into a series of flat-topped ridges running from east to west. In contrast, streams to the east of the ridge, beginning with the Deil-Bach, flow generally northwards in steep-sided valleys towards the Ruhr. As noted above, both drainage patterns show in detail considerable adjustment to the underlying geological structures.

In the formation of these surfaces, the tectonic forces responsible for the uplift and tilting of the Rhenish Uplands, and the subsidence of the Lower Rhinelands, were perhaps the prime cause. This differential movement has gone on from Oligocene–Miocene times. In addition, changes of sea level in glacial times have affected the formation of the lower members of the terrace sequence. Adding to the complexity, the considerable thicknesses of loess and blown sand make surface height an unreliable guide in the identification of terrace remnants. However, there are some fairly well substantiated keys to a chronology.

The pebbles on the Higher Terraces include some of white quartzite, derived from far to the south and associated with the first Rhine to flow completely across the present Rhenish Uplands. This event took place in Lower Pliocene time, and the Higher Terraces are therefore regarded as Pliocene. Some workers consider the Berg peneplain also to be Pliocene, but others believe it to be part of the *Trog*. This is an upland surface sunk beneath the summit levels of the Rhenish Uplands, which was developed by the Rhine system before that river became the outlet for the Rhine Rift Valley in the south. If this identification is correct, then an Upper Miocene date is to be assigned to the peneplain.

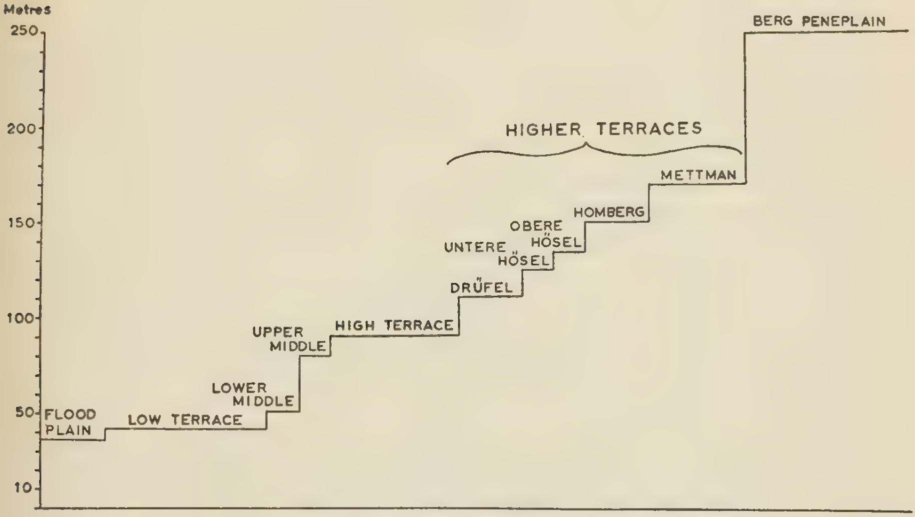

Fig. 3.—Diagram of terraces of the Rhine in Lower Berg.

The Low, Middle and High Terraces are Pleistocene. The lowest of the levels of the Low Terrace can be quite accurately dated as it contains rolled pumice from the area of recent vulcanism in the Neuwied Basin. It is therefore younger than the vulcanism, which took place about 10,000 B.C., and has been formed during approximately the last 12,000 years. The middle or upper level, according to whether the Low Terrace is divided into two or three, has the same volcanic deposits laid upon it in the Neuwied Basin. It is therefore older than the vulcanism, and is dated to the last glaciation (Würm or Weichsel) of the Ice Age. The lower Middle Terrace of the Ruhr at Kupferdreh, and the Middle Terrace of the Rhine at various places downstream, have material from the preceding glaciation (Riss, Saale or penultimate) resting upon them, and are therefore regarded as of Riss or pre-Riss age. There is indeed a considerable difference of opinion as to whether the Low and Middle terraces were formed during the actual glaciations or in the corresponding interglacials.[5] It is a problem similar to that of dating the Thames terraces. The loess and blown sand are generally of Würm age, although some Riss loess remains, covered by the later deposit.

The surfaces of Berg therefore extend in a sequence from Upper Miocene or Lower Pliocene to very recent times. They constitute the younger members of an even more extended sequence of surfaces developed in the Rhenish Uplands as a whole. This greater sequence extends up and back to levels at, for example, 600 and 700 metres in the Hunsrück, that are considered Oligocene in age, surfaces developed when the Rhenish Uplands had not been upraised and the river system was very different from that of to-day.

REGIONS OF LOWER BERG

The differences in elevation, accessibility and soil shown by the surfaces are reflected in the pattern of human utilization, and so provide a basis for a simple division of Lower Berg into small regions (Fig. 1).

The Rhine Low Terrace. The main centre of Frankish expansion into the region was the Low Terrace of the Rhine, where fertile soils attracted early settlement. Here, before the age of industry, were large villages, bearing early place names terminating in *-ingen* or *-heim*, and surrounded by open arable fields divided into numerous strips. In the last century, however, the Low Terrace has been transformed by the spread of the heavy industrial towns of Duisburg and Düsseldorf, so that in its human geography the region is now quite distinct from Berg.

The Rhine Middle Terrace. The blown sands of the Middle Terrace are still predominantly forested, although conifer plantations have in part replaced the original oak, birch and hornbeam woodland. The land is naturally not of high value, which explains why the terrace is now followed southwards by the *Autobahn* from the Ruhr to Cologne, one of the busiest roads of Europe. The region is sparsely populated, but on its outer edge stands Ratingen, the western gateway to Lower Berg, founded in 1276, and like Düsseldorf originally intended to secure the political gains of Berg against encroachment by the Archbishop of Cologne. The walled medieval heart of the town still shows the characteristic domestic architecture of Berg, black and white half-timbered houses with the weather side hung with slates. Industrially, however, Ratingen shows the pull of Rhine and Ruhr in its large engineering works.

The Mettmann Loess Plateau. The loess-covered parts of the High and Higher Terraces in the neighbourhood of Mettmann constitute a distinctive and interesting region. Despite the elevation, it differs from the usual poor hill country of the Rhine Uplands in the way that the existence of loess has led to its almost total clearance of woodland for arable cultivation. On the other hand, it is too high and wet to be a typical loess region, occupied in the earliest phase of German settlement and bearing large villages developed in association with the classic open-field system. Instead, rather late settlement, from the ninth century onwards, has left a pattern of single large farms, each perhaps with one or two attendant cottages for landless labourers. Many of the place names have endings in *-bach*, *-feld*, *-rath* and *-scheid*, typical of land occupied in the medieval forest clearances. The subdivision of the farms has been prevented by the custom of primogeniture, inheritance by the eldest son only, which Lower Berg has in common with the Westphalian and Saxon lands to the east and north.

Agriculturally, the loess region produces cereal crops, including wheat, but not the sugar beet so characteristic of loess lands at lower altitudes. Increasingly the high rainfall and proximity to the great urban markets of Rhine and Ruhr have encouraged meat and milk production, based on the growing of fodder crops. These are not grazed in the large, unfenced arable fields, but are fed to cattle in their stalls.

Practically all the features of settlement—roads, farms and the only town, Mettmann itself—are confined to the east–west interfluves. The narrow valleys were avoided by routes before the railway age, and were little settled, except for a few mills. Their steep sides to-day bear remnants of deciduous woodland, some enclosed pastures and fruit trees, with scattered cottages.

The Ruhr Valley. As noted above, the floor of the Ruhr valley is liable to flood, and so is avoided by settlement and left under grass, which to-day is giving place to reservoirs and filter beds serving the Ruhr industrial centres. The small towns, like Kettwig and Werden, cling to the slopes above, generally on Middle Terrace remnants. They still have a close affinity with Berg architecturally, but economically the links are with the coalfield to the north, to which the river, which itself remains astonishingly unspoilt by industry, has given its name.

The slopes rising from the Ruhr are repeatedly broken by terrace remnants, frequently loess-covered and bearing arable fields and large isolated farmhouses. The slopes themselves, above both the Ruhr and its tributaries, are generally left in wood or pasture, with a considerable sprinkling of half-timbered and slated cottages. Where the valleys cut across the synclinal folds, they often expose anthracitic seams at the base of the coal measures, and although the centre of mining has long passed away to the north, a number of small shafts and drifts remain. Where these are closed, they have often been succeeded by brickworks.

The Velbert Hills. This subdivision consists of the Higher Terrace remnants which are not loess covered, and the Berg peneplain. Here again, occupation was late, as the many place names terminating in *-rath* and *-scheid* bear witness. Owing to the deep dissection, the poor stony soils, a rainfall of up to fifty inches and the relatively high elevation, the proportion of cleared land is far smaller than on the loess. Forest still remains on the valley sides and on the quartzite ridges, while pasture and fodder crops predominate on the cleared land.

Once more, the rural settlement is of a dispersed nature, but the few large farms are surrounded by many scattered cottages. Indeed, the density of population in this unfavourable environment has for centuries been greater than on the rich loess land to the west. This has been possible only because the inhabitants have been forced by the very poverty of the soil to turn to manufacturing in order to supplement their incomes.

The hills also contrast with the loess region in having a number of towns, which are not of medieval foundation like Düsseldorf or

Ratingen, but have developed under the influence of industry, especially in the last 100 years. They have grown rather haphazardly through the agglomeration of houses around the occasional churches and markets which originally served the scattered farms and cottages. Decisive in the location of the towns were the interfluve ridgeways, especially the route which follows the ridge west of the Deil-Bach, linking the heads of all the interfluve ridgeways running up from the Rhine, and providing a north–south connection from the Ruhr crossing at Werden to Wuppertal and, ultimately, Cologne. On this route stands the largest of the towns, Velbert, which straggles along the intersecting ridge roads, especially southwards towards Tönisheide and westwards through the elongated ridge-top town of Heiligenhaus towards the Rhine. This latter route can also be followed eastwards beyond Velbert into the neighbouring region of Mark, crossing the Deil-Bach at Langenberg, unusual among the towns of Lower Berg in its valley situation.

INDUSTRY

Industrially, Lower Berg is but one small part of the northern fringe of the Rhenish Uplands where Siegerland, Mark and Berg were of great historical importance in the development of the iron and steel industry. With the growth of large-scale production on the Ruhr coalfield, these regions have been able to survive industrially only by employing their skilled labour in a variety of the lighter metal trades. Before the age of coal, high-quality iron from the Siegerland used to be turned into steel swords, knives and razors by the smiths of Solingen in Upper Berg, or into hand tools and similar iron goods at nearby Remscheid.[6] Some of this work was put out to smiths living farther north along the ridgeway through Lower Berg, and stimulated the expansion of industry there. From the seventeenth century these smiths began to heat their iron with coal that had been mined in shallow pits in the valley of the Ruhr and brought south by horse along the ridgeway. From this time onwards there was an increasing specialization on the manufacture of locks and keys.

The development of large-scale mining and heavy industry on the Ruhr coalfield after 1850 stimulated further industrial expansion in the Velbert hills, and substituted new economic ties with the north for the old links with Remscheid, Solingen and the Rhine. To-day the Ruhr provides practically all the needs of the region's industries: iron, steel, piped coke-oven gas and, to a lesser extent, non-ferrous metals and electricity. To the locational advantage of a labour force long accustomed to the skilled working of metals is thus added the advantage of a situation on the fringe of one of the world's greatest centres of heavy industry. The main disadvantage is the difficulty of communications in the hills, but this is minimized by concentrating on products which are low in weight but high in value.

The most characteristic of the metal industries is the manufacture of locks, keys, hinges, latches and similar door and window fittings at Velbert and its neighbours Heiligenhaus and Tönisheide. Together these towns account for over one-third of West German production in these branches of industry, and in particular predominate in the manufacture of door locks.[7] The B.K.S.–Yale lock factory in Velbert is claimed to be the largest in Europe, but the typical lock works is small, often just a workshop in the back garden of a house in one of the long streets which straggle along the ridges. Taking *Land* North Rhine–Westphalia as a whole, there were, in 1953, 360 lock works with fewer than 50 workers, but only 26 with more than 200. Many of the tiny works are highly specialized, concentrating on one product only, like locks for vehicles or for leather goods, or even on part of one product only, like safe keys.

Some lock works have developed their own iron foundries to provide the necessary parts, and by a natural process these have come to engage in more diverse engineering work, such as the manufacture of machine parts for assembly elsewhere, or even the production of small machine tools. The needs of the lock works have stimulated industry over a wide radius; for example Mettmann, in the loess region, makes lock springs, and has from this developed the manufacture of scales and balances. A rather different group of industries has evolved in the valley town of Langenberg, with its plentiful water for power and processing. Out of an ancient silk industry developed the manufacture of paper. To-day the town produces a wide range of packagings and other paper goods, and in particular has a large works for the making and printing of railway and omnibus tickets. It also has a number of foundries and light engineering works of the type already familiar in other parts of Lower Berg.

Dependence on Ruhr industry is also characteristic of the exploitation of the principal raw material found within the borders of Lower Berg, the Devonian limestone of the Wülfrath district. This deposit is important not solely on account of its purity, but also because of the ease by which it can be sent by rail down the Anger valley for use as a flux in the blast furnaces of the Ruhr. At these quarries, the greatest concentration of limekilns in the whole of *Land* North Rhine–Westphalia produces about a quarter of the West German output.[8] Proximity to the large towns of Ruhr, Rhine and Middle Berg is also an important factor in the working of the Low Terrace gravels for concrete aggregate, and of the Oligocene sands for building and moulding purposes.

In this corner of the Rhenish Uplands, between the Rhine and Ruhr rivers, the sequence of river terraces and the deposition of loess has so modified the normally unfavourable environment of the Hercynian massif that agriculture is unusually well developed. But far more striking than this has been the industrialization and urbanization of the higher and poorer portions of the land, a real triumph of man over an initially unfavourable environment. The predominant influence on the later stages of this development has been the Ruhr coalfield, so that both in its agriculture and its highly specialized industry, Lower Berg falls into place as but one of a series of satellite regions which in *Land* North Rhine–Westphalia surround the great industrial power house of the Ruhr.

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Teaching Geography in Malaya

I. In a British Army Secondary School

W. J. BENNETT

OF THE FIVE BRITISH ARMY CHILDREN'S SECONDARY SCHOOLS in the Far East, two are located in Malaya. Slim School, a residential Modern School, lies in the cooler Cameron Highlands of Northern Malaya, while my own school—Bourne School—is in Kuala Lumpur, the Federal Capital of the country.

The Armed Services are, of course, the Local Education Authority for all children of Servicemen living overseas. Every effort is made by them to see that the education of these children is not neglected, not an easy task when the children are rarely in the same place and the same school for more than two years. When the children return to the United Kingdom, therefore, they may sometimes be backward in certain subjects by comparison with children who have had a more normal life. On the other hand, life in the Services overseas offers advantages for education in its fullest sense that cannot be offered by any L.E.A. in the United Kingdom. Because he has travelled and

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lived in a foreign country, because he has lived in the fairly close community of the Services, a child is often more mature, more social, more tolerant, and more generally knowledgeable about the world than a child of similar age and ability who has spent all his life in the United Kingdom.

For a geography teacher, the advantages of an Army School certainly far outweigh the disadvantages. Mathematics, the sciences and languages are progressive subjects, each succeeding year at school taking the child a stage farther in the subject; and the later stages cannot be grasped without mastery of the earlier. Geography, by comparison, is not so much progressive as increasingly comprehensive. Thus, the broken schooling is not a major drawback. It can even be an advantage, because the children very often have a great fund of experience on which to draw. But the biggest advantage of all is living temporarily in an unfamiliar country. Whatever the age or ability of the child, there is a spontaneous interest in the subject, in the "where and why of things and of people".

The Malayan environment is particularly interesting. Its climate, vegetation, crops and farming methods, plantation agriculture, alluvial mining, and several groups of races, are all unfamiliar. It is possible to study the way of life of Malayan aborigines (there is an aborigine settlement within a few miles of Kuala Lumpur), and yet to observe one of the more successful multi-racial communities of the world.

Nominally, the Grammar stream geography syllabus at Bourne School (which is bi-lateral) is a five-year one leading to the London G.C.E. Ordinary level examination (a few go on to Advanced level), but G.C.E. work can—and sometimes must—be crowded into two years' study or less in the fourth and fifth forms. Freed from an external syllabus in this way, it is possible for the younger children on the Grammar side, as well as the Modern, to get the maximum benefit from the setting in which they are living. Every effort is made to refer back to the British Isles during each major topic, for most of the youngsters will be returning to schools in the United Kingdom, and geographical vocabulary and geographical truths are the same wherever the school. Tin mining can lead easily to coal mining (vegetation similar to that of the Coal Measures forests is found in Malaya); rubber leads easily to cars, and cars to iron and steel. The children's experiences of travel by troop ship or 'plane along some of the most important routes in the world can be used in learning the relationship between longitude and time, and they have already noted that the length of day and night varies little near the equator.

On the Modern side at Bourne School, the equivalent of the two years' G.C.E. work for the older children in the Grammar stream is the study of Malaya as a producer of raw materials, with many outside visits, and of Britain as a manufacturing country. In addition, an elementary appraisal of the British Commonwealth, of the great world powers and of world politics and current affairs are not difficult with youngsters whose fathers' concern is the Emergency in Malaya and who themselves come into daily contact with far more Asians than Europeans. Learning to understand world affairs is made easier by the absence of the distraction which adolescents in Great Britain have of inviting jobs and the prospect of "earning"!

Ingenious aids for class teaching can be devised in these tropical surroundings. A cylindrical cigarette tin—the "end product"—is a useful container for tin-bearing sand, and the principle of alluvial mining can be simply but effectively demonstrated by washing a sample in the lid. A rubber tree can be grown from seed in a cigarette tin and smoked sheet-rubber scraps are easily obtained. Air photograph mosaics provided by the Army are a particular help in map-reading work. A personal "Malayan Scrapbook" kept by all members of the lower school helps to illustrate the personality of the country. Two wall clocks in the geography room—Malayan time and Greenwich time—demonstrate the relationship between longitude and time, as well as being a constant reminder that neither Malaya nor Britain is to be thought of in isolation.

The three main classroom blocks of Bourne School stand on terraces of the foothills of the Central Range of Malaya. The room chosen as a geography room stands at the end of the lowest block; a few yards beyond it, a short steep slope drops to the lowest of the terraces and overlooks the flat land on which the northern part of Kuala Lumpur is built; a small rubber plantation and coconut palms are nearby.

The room itself is not large and space has to be used very economically. The ceiling is used for a map rail, points of the compass, a model solar system; wall space is increased by using hinged plywood leaves on the side-walls; shelves and lockers are built at shoulder level to save floor-space.

But there is plenty of room in the open air. A plot of specimen crops is flourishing: several types of pineapple, banana, yams, sweet potatoes, ground nuts, ginger root, tapioca, sugar cane. To make this plot it was necessary to dig up great iron concretions from the raw laterite and to add organic matter (dung arrived in an Indian ox-cart), a lesson in itself! In the longer dry spells, the gently sloping plot can be irrigated through a little system of channels fed from the open concrete monsoon drain, which is fed in its turn from a tap; in the wetter spells, the same channels, with an outlet, can be used to drain the land.

Rice seeds—a quick-maturing variety from Formosa—are planted in an old ammunition box, the "nursery field", and the seedlings of the third crop are now well established in a shallow flooded basin dug from the laterite. The mud on the floor of this basin is not churned by oxen in native fashion, it is true, but the basin is kept flooded through a channel fed by damming the monsoon drain with mud, exactly as the

Malays flood their *padi* land by damming a stream. All digging is done with a Malay *changkul*, a kind of mattock.

Young rubber planted out in terraces on hills not far from the school gives a remarkably bold contour effect. Observation of this and of air photographs, in which the terraces stand out as bold lines, and a contour map, make possible very effective teaching of contours.

Near the crops, a Stevenson Screen containing thermometers has been erected and a rain gauge is installed nearby. Daily records are kept and used in conjunction with observations of the crops. The characteristics of Malayan climate are illustrated also by a model Malay house with its *atap* roof steeply pitched against the torrential rain, and its verandah to give fresh air and shade from the hot sun. (The classrooms themselves have borrowed these ideas.)

Even the steep slope at the edge of the terrace has its uses. Part has been cleared to illustrate soil erosion, part is protected by grass in one place and by bushes in another. Eventually it should be possible to show how contour check-banks and contour ploughing check erosion. In addition, a miniature hydro-electric scheme, using the fall of water in the monsoon drain as it drops down the slope, functions with a lead pipe and a simple turbine and dynamo made in modern-stream science lessons from treacle tins, copper wire and a steel knitting needle. The power is sufficient to light a flashlight bulb.

At Bourne School, we work from 8.45 a.m. until 12.45 p.m. on six mornings a week, from 2.15 p.m. until 4.00 p.m. on two afternoons, and games, drama or extra coaching may take up other afternoons. Although to some Europeans, the combined heat and humidity of the Malayan climate is enervating, for children to-day it is very healthy and I personally have found it most pleasant to work in. It is true that it can occasionally be trying in the afternoon, but as a rule, electric fans and ice-water alleviate its worst effects. In any case, the staffing ratio is generous, forms are usually small and teaching need not be arduous. The largest are the first and second forms which may have thirty or more children, but the higher the form, the smaller the number.

To sum up, teaching in an Army School in Malaya has proved a most enjoyable and stimulating experience, and though when I made the initial venture it seemed somewhat hazardous, I have not for one moment regretted it.

II. In a Federation Secondary School

P. P. COURTENAY

Sultan Abdul Hamid College

The Sultan Abdul Hamid College at Alor Star is the largest English Secondary School in the State of Kedah and has the only sixth form north of Penang. Kedah is one of the four Malay states or settlements which are primarily padi-growing regions and have a majority of Malays in their populations. Although the proportion is lower than in Kelantan or Trengganu, 67 per cent of the inhabitants of Kedah are Malays (mainly padi planters or fishermen) and the community* structure of the 778 students of the College in January 1958 reflects this proportion: Malays 533 (68·5 per cent), Chinese 181 (23·2 per cent), Indians 55 (7·1 per cent), and others 9 (1·2 per cent).

The College is fed by three English primary schools, and pupils who successfully pass the selection examination enter form 1 at the age of 12 or 13. The selection examination is similar in many ways to the much-criticized 11-plus examination in Britain and contains a perceptual test. Because there are so few secondary schools in the Federation however, it does not seem likely that the examination will be abolished for many years to come. There is, as yet, no secondary education for all in Malaya. Since at the moment there are no Malay language secondary schools in the Federation, a few selected boys from Malay primary schools come to the College after two or three years in special Malay classes at the English primary school, or, if they are too old, join the College's Remove. After three years in the lower school, pupils sit for the Lower Certificate of Education to decide whether they shall enter form 4 and begin a School Certificate Course or attend a Day Training Centre for two years which will then qualify them to teach the lower forms of primary schools, or leave school.

Boys who do sufficiently well in the Lower Certificate are awarded a "promotion certificate" and enter form 4 in the College, choosing either the Arts Course (where they take General Science in addition to History, Geography, English and Malay) or the Science Course (dropping History but taking separate Chemistry, Physics and Biology). All sit the Cambridge Oversea School Certificate, usually after two years. Those who achieve satisfactory certificates may be selected to

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* The term "communities" to describe the Malays, Chinese, etc. was suggested by M. V. del Tufo, in the report on the 1947 Census, to replace the inaccurate (in this context) term "race" which is still in popular, official and unofficial, use.

be trained as teachers either at the Malayan Teachers Training Colleges at Kirkby (Liverpool) or Brinsford Lodge (Wolverhampton), or at the Glugor Training College in Penang.* Previously, holders of School Certificates were permitted to teach in primary schools, and even the lower forms of secondary schools, with no further training other than part-time "normal" classes for three years. These normal classes consist of lectures on English language, Malay, oral English, teaching method and a final qualifying examination. This route into the teaching profession will, however, be closed by mid-1959.

Students who wish to take their education beyond School Certificate by entering the College's sixth form must, in addition to obtaining a good certificate, pass the Federation Sixth Form Entry Examination. The need for this extra qualification is obvious when it is realized how few sixth forms exist in the Federation. Sultan Abdul Hamid College draws sixth formers from English Schools elsewhere in Kedah and Perlis, including a small number of girls. After two years in the sixth form, students take the Cambridge Oversea Higher Certificate and the way is then open for the few to Universities (usually Singapore, Australia or the United Kingdom) and the professions.

The Chinese schools are quite separate from this Malay/English educational ladder and teach mainly in Chinese. It is in these Chinese secondary or "middle" schools that over-aged pupils are a problem and where disturbances have taken place. The Federation Government plans to incorporate the Chinese schools into a national education system, which means examinations being taken in English or Malay, and eventually only in Malay. The fear that this will eliminate traditional Chinese culture is one of the causes of dissatisfaction in the Chinese schools.

Although the existence of over-aged pupils is a problem chiefly of the Chinese schools, the average age of the forms at Sultan Abdul Hamid College is higher than that of their equivalents in Britain.

AVERAGE AGES OF FORMS, JANUARY 1958

	yrs.	*mths*		*yrs.*	*mths.*
Form 1	13	6	4 Arts	16	7
2	14	8	4 Sci.	16	7
3	15	6	5 Arts	17	7
			5 Sci.	16	10

	yrs.	*mths.*
Lower 6th	17	11
Upper 6th	18	5 (including two over 21)

One boy in the present fifth year is over 20 years of age. In many cases the relatively advanced age of forms 5 and 6 does create greater maturity in the students (many of whom of course are as old as University students in Britain) and produces a pleasingly serious approach to their studies. Unfortunately full advantage of this maturity has not always been taken owing to the poor qualifications and dated teaching methods of some staff. Also it is difficult for the students to follow up their interests in their own time: Alor Star has no library outside the College, and evening work in Kedah—thanks to mosquitoes, lack of facilities in village homes and early bed necessitated by the 7.30 a.m. start of the school day—is difficult. However, the sixth form particularly make good use of the school library which is being built up as funds permit.

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* According to a report in the *Straits Times* of 11th January 1958 the Federation Government is considering closing Kirkby and Brinsford Lodge (which at present turn out 300 qualified teachers each year) and training all its teachers in Malaya.

Staffing

One of the principal problems that faces Secondary schools in Malaya is that of finding qualified staff, and Sultan Abdul Hamid College is no exception. Graduate staff and teachers of English are particularly needed. On the Arts side in the upper school especially, teachers are in short supply—an unusual position compared with Britain and with other schools in the Federation. Of the twenty-eight teachers in the College, seven are graduates (four, including the headmaster, being Europeans) but these are always likely to be moved to more senior posts elsewhere in the Federation. There are 11 college-trained (in England or Malaya) and 17 normal-trained teachers.

Since it is planned to end normal training in 1959, the proportion of normal-trained teachers will gradually fall, but there will have to be a rapid increase in the output of the training colleges to replace them. Normal-trained teachers serve Malaya well. What they may lack in qualifications, they frequently make up for in keenness, and one very experienced normal-trained teacher is at present making a considerable success of teaching Higher School Certificate history. Under the plans for Malayanization, the Europeans on permanent establishment are to be completely replaced by 1962. Many in fact are already leaving (with their compensation)—an unprepared-for eventuality which is making staffing difficulties more acute. There is no likelihood that Malaya will find enough Asian graduates to replace the departing ex-patriates, so it is probable that, for some time yet, contract graduate teachers will be sought from Britain.

Syllabuses and Examinations

The fact that an external examination—the Lower Certificate of Education—is taken at the end of the third year, in addition to the examinations in the fifth year, means that syllabuses are necessarily more rigid than they are in Britain, and this rigidity is increased by the fact that outlines of work for all forms are laid down by the Ministry. Where so many teachers are poorly qualified and inexperienced, this offers useful guidance but at the same time leaves more than sufficient scope for personal preferences and ideas within the syllabus.

The introduction to the "Syllabus for the Teaching of Geography in English-Medium Schools in the Federation of Malaya" states that

"The syllabus for the Secondary (academic) English School consists of a study of the world (by continents) regionally. This is preceded by a brief survey of the world, through a study of the Home District and Malaya (as a basis of comparison) and the rest of the world (Natural Regions)." According to the Schools (Courses of Studies) Regulations 1956 which began to come into operation in January, 1958, this work is then apportioned as follows (with some abridgement of details):

FORM 1

Malaya and the World's Natural Regions

The home area, then Malaya in general. Map work and weather observations. Examples of land forms introduced through the study of local district. Natural Regions. Ice cap and Tundra, Cool Forests, Mediterranean etc.

FORM 2

A Regional Study of the Southern Continents

A. Australia and New Zealand.
   Isohyets in connexion with Australia.
B. South America.
   Latitude and longitude. Isotherms.
C. Africa.
   Similarities of southern continents.

FORM 3

A Regional Study of Asia

A. Southeast Asia.
B. China, Japan and Central Asia.
C. India, Pakistan, Ceylon and Middle East.
   Physical Geography. Formation of rocks and simple geology with special reference to tin. Wind erosion and deposition. Local climatic observations. Map work.

A 1½-hour Geography paper is then taken as one of the subjects of the Lower Certificate of Education.

The syllabus continues:

FORM 4

A Regional Study of North America and Europe

A. North America.
   Physical geography—meanders and ox-bows, the Ice Age, soil erosion.
B. Europe.
   Political geography—boundary problems.

FORM 5

A Review of the World's Physical and Human Geography as seen from the Malayan point of view.

FORM 6—UPPER AND LOWER

Preparation for Cambridge Oversea Higher School Certificate.

This syllabus, which clearly owes much to that suggested by the I.A.A.M. with adaptations to the Malayan environment, will be fully in operation by 1961. From 1958, the Higher School Certificate will be conducted by the University of Cambridge in conjunction with the University of Malaya. The inclusion of physical geography where especially relevant in the syllabus seems particularly commendable, though past experience suggests that a systematic course of physical geography will be essential in the fifth form.

The nature and problems of Geography teaching.

The great shortage of graduate teachers of all subjects in Malaya means that the few who are available concentrate on the upper forms—sixth, fifth, and whenever possible, fourth. The lower school is taught mainly by the less qualified, and geography at Sultan Abdul Hamid College up to form 3 is in the hands of a normal-trained teacher. Lack of background, experience and training means that much of the lower-school work is taught direct from the textbook, maps are assiduously copied and masses of detail memorized. Until recently most of the upper-school geography was taught in a similar way—in many cases from textbooks that were inappropriate or too advanced. E. H. G. Dobby's *Southeast Asia* has been in general use in form 4 and studied systematically chapter by chapter. Much of it was not understood, and although many highly detailed and beautifully drawn maps were copied, no real efforts were made to correlate facts, sift out essentials or draw conclusions. One example from form 4 illustrates this. During the study of the Philippines, large full-page copies were made of the maps of Rainfall regimes, Agriculture and Population density found in *Southeast Asia*, as well as of a physical map. There had been no attempt to relate the maps one to another or to draw conclusions. The normal-trained teacher in charge of the class responded with enthusiasm to the suggestion that traced maps that could be superimposed, and a written statement of the observed relationships, would be a profitable exercise. Suggestions of this sort, made and taken in the right spirit, are some of the practical ways in which the ex-patriate geographer can help his less qualified but very keen Malayan colleagues.

Outdated teaching methods and too difficult textbooks have produced, in many pupils, a strong dislike for geography and a general absence of any critical approach or awareness. So accustomed were classes to copying facts uncritically from textbooks, that two months after *merdeka* (the granting of independence to the Federation of Malaya) a fifth-form boy, in an exercise on Singapore, described the town as the administrative centre of Malaya. Quite often the methods failed utterly, in that work done was simply not understood and certainly not remembered. An additional burden was then placed on fifth-year teaching—to make comprehensible what had been done in the fourth.

A change of approach produced more interest and enthusiasm almost immediately. Instead of being tied to the textbook, form 5 clearly appreciated having problems explained to them, comparisons drawn with familiar places, and references made to personal experiences. The books, which previously had been studied like literature texts, were used mainly for reference or as sources of material for homework exercises.

There was, however, a residual advantage of the old teaching method. Some students had a commendable but disturbing tendency to check on points made in oral teaching by referring to the familiar text and were not backward in pointing out what they considered were discrepancies. This of course was all to the good, provided that the book was up-to-date and that the discrepancy was not just a matter of opinion. Where what was taught *did* differ from what was written, the impression was given that the book was considered right and the teacher's viewpoint was suspect. However, criticism and suspicion of the teacher's argument are no doubt steps in the direction of criticism and suspicion of the book, and, so long as the teacher is sure of his facts, are to be encouraged.

Special problems of the Sixth Form.

Sultan Abdul Hamid College has no real tradition of a sixth form. Previous sixths have existed but students have never stayed to sit for the Higher School examination. However, in 1958 there exists for the first time both a lower and upper sixth numbering 61 in all. They are divided into Arts and Science groups, and there are 32 of the Arts group studying geography (mainly in combination with history, English or Malay). In some subjects—and geography has suffered in this way in the past—the sixth-form teaching has been done by relatively unqualified staff following the sterile methods of the lower school. The resulting attitude to geography was uncritical and lacked any appreciation of the cohesion of the subject. There was in addition no past experience of private and individual work—the detailed study and dissection of a limited number of difficult textbooks created little enthusiasm for the subject. Fortunately the relatively advanced age of the sixth-form students produced a sufficiently mature outlook for a ready response to a change of approach.

The mere abandoning of textbook dissection and its replacement by straight oral teaching created a more favourable reaction almost immediately. The attempt to encourage questions and comments took a little longer to bear fruit. Questions are now more readily forthcoming, often querying any difference of emphasis or opinion from the book, but so far comments or constructive contributions are limited. The geography section of the sixth-form library is at present small but contains a nucleus of basic texts which are valuable. The expansion of the library is nevertheless a necessity, since on the whole the sixth form are keen to read. The mere suggestion that a chapter or section of a particular book is relevant or interesting leads to its being borrowed and circulated at once.

There is an enthusiastic College Geographical Society, mainly supported by the sixth form but with some fifth and fourth form members. Like all school societies in Malaya, it has to have a written constitution and be formally registered (one of the preventive measures against subversive school cells particularly feared in the Chinese schools), but this does not detract from its usefulness. Visits have been made to places of geographic interest, and a recent joint historical/geographical society project produced some excellent work on the fishing port of Kuala Kedah at the mouth of the Kedah River. The ruins of a Portuguese fort, and a thriving fishing industry provided adequate material for historians and geographers alike (the same students tend to be members of both societies). A duplicated fact-sheet was produced embodying the results of the investigations. Further projects of this nature are planned, and are, as is fully recognized in Britain but less so in Malaya, an excellent means of illustrating the unified nature of the various aspects of geography, as well as stimulating interest and ability in the subject as only original work can. The Geographical Society, although voluntary and open to non-geographers, is a valuable adjunct to sixth-form studies and it is planned to develop its activities as much as possible.

A very generous timetable allowance of eight periods a week for both the upper and the lower sixth has made it possible to experiment in widening the sixth formers' understanding of geography and in making them more active in the subject. On the theory that individual work, either in the library and classroom or from observation in the field, is the best cure for mature pupils who previously had been bored by a surfeit of textbooks, a system of seminars for the upper sixth and weekly field exercises for small groups of the lower sixth has been worked out. Since lack of oral criticism and over-reliance on one or two textbooks were the major deficiencies of the upper sixth, one period a week has now been set aside as a seminar period. Each week one member of the class reads a ten-minute paper on a topic set three weeks previously, whilst the rest take note of any weaknesses or well-made points. At the end of the paper, another member of the class is expected to make a few comments, criticizing, praising or questioning the speaker. The topic is then open to general discussion. After an initial "warming up" period in the first week, the idea of the seminar seems to have caught on and quite vigorous—and relatively well-informed—discussions have taken place on subjects such as the feasibility of the Federation's avowed agricultural policy of making Malaya self-sufficient in rice, and the advantages and disadvantages of industrialization in underdeveloped countries. It is mildly satisfying to find the beginnings of balanced judgments, whilst the occurrence of quotations from sources such as the Lecturer in Economics at the University of Malaya shows that the seminars are making the sixth form look beyond the textbook to seek ideas and information from a wider field.

For the lower sixth, a weekly field exercise has been instituted. For one double period each week a group of four is taken to a previously selected spot—perhaps one offering a good view of river activity or a suitable point in the padi-fields—and a set of questions is handed out for answering from observations and requiring the drawing of sketch maps and field sketches where appropriate. The following week, when a different group is out somewhere else, the observations are written up, conclusions drawn and sketch maps checked with the topographic sheet. At present the scheme has been in operation for too short a period for any assessment to be made of the degree of its success. However, the work is tackled very enthusiastically and there is keen interest each week to know the details of the exercise. Whilst each group is out in the field, the rest of the class is left with a practical exercise—for example on maps, climatic statistics, rock specimens—in the geography room.

It is appreciated that none of the methods being tried, either with the sixth form or lower in the school, is new when thought of against the background of English grammar schools and Departments of Education. They are, however, being tried in an environment in which, in general, the more progressive notions of geography teaching have been missing, and to solve a particular problem. It remains to be seen whether any desirable results will be forthcoming.

There is no doubt that the educational system of Malaya is in flux. Malayanization and the difficulty of replacing ex-patriate teaching staff, the introduction of new syllabuses and examinations, the great shortage of secondary schools and teachers, the problem of over-aged pupils and the difficulties created by the Chinese schools all call for responsible, level-headed and broad-visioned action. Whether the Federation Government and its future Education Ministers can provide this remains to be seen. What is clear, however, is that good geography teaching can help the future leaders of Malaya (who are largely, at present, those educated in the Government English schools) to appreciate the peculiar difficulties of the country. Geography, perhaps more than any other discipline, can show the extent to which the prosperity of the Federation is dependent upon all the groups in the population—Malay, Chinese, Indian and European—and can help to illustrate how only the acceptance of the existing plural society, with opportunities for the different cultures to exist equally and develop freely along their own lines, can possibly create a truly contented and prosperous Malaya.

This Changing World

EDITED BY G. J. BUTLAND

PEAT FUEL PRODUCTION IN THE IRISH REPUBLIC

Peat is now making a major contribution to the solution of the fuel problem of the coal-deficient Irish Republic. This is largely the result of a modern revolution in peat working brought about by the application of machines, but it also conforms to the official policy of self-sufficiency and the provision of more employment within the country. The development of its peat resources is a logical step, for the Irish Republic has more peat in proportion to its area than any other European country except Finland.

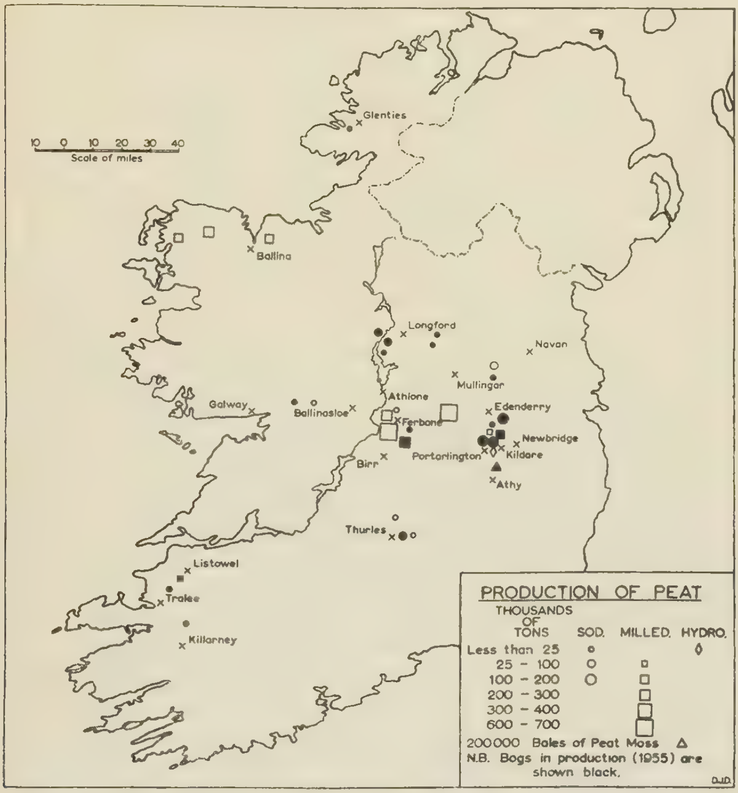
Economical production of this low-grade fuel on a large scale is possible only with a high degree of mechanization. Small-scale peat fuel production by hand is traditionally a widespread occupation in Ireland, but mechanized methods are limited in their application to certain bogs suitable by reason of their configuration, extent and depth. Besides the flatness essential if machines are to move over the bogs, it has been found that areas smaller than 450 acres cannot be profitably developed by the present methods. A depth of peat of at least ten feet is also desirable.

The peat deposits are mainly located in the central counties, Offaly, Laoighis, Kildare and Westmeath having become the principal areas of large-scale exploitation. The belt of deep, low-lying peat bogs extends, more intermittently, farther to the northwest into Longford, Roscommon and Leitrim. In the western counties the bogs are generally much smaller and shallower. The main deposits of the south cover the tops of the hills and are never likely to be worked on a large scale.

The first step in bog development for large-scale fuel production is four or five years' intensive drainage of the selected area. When this reaches its final stages light railways are laid and roads built on the bog surface. Peat cutting begins when the general moisture content has been reduced to 80 per cent down to a depth of 8 feet. Because the peat must be dried in the open air (no more efficient way has yet been devised) all cutting operations take place between April and August.

The sod peat method is the oldest form of production employed by *Bord na Mona*, the State-sponsored organization in charge of peat fuel development. After the removal of the useless top surface of the bog, a 40-ton cutting machine digs out the denser peat beneath by working along the vertical face of a trench with bucket excavators. It incorporates a macerator which minces and mixes the peat to give a more uniform product. The peat is then extruded along a boom which extends at right angles to the direction of travel. The resulting strip is then chopped into sods and tipped off the boom on to the ground. Each machine is driven electrically from trailing cables attached to overhead power lines and moves along caterpillar tracks. Output averages ten tons per hour.

After six or seven weeks on the ground the sods dry out to a moisture content of 75 per cent. They are then built up into small piles (until recently entirely by hand, but this operation too has now been mechanized) for further drying. A sod-collecting machine later stacks them in ricks beside the rail lines, and there the moisture content falls to 35 per cent, the best that can be achieved out-of-doors. Loading, also mechanized, is followed by a short rail haul to the power stations. A significant post-war development, these have been sited on the edges of the bogs which supply them with fuel.



The basis of the future development programme of *Bord na Mona* is not, however, sod but milled peat. Production of the latter is based upon diesel-powered vehicles which use a large drum studded with spikes to strip the top half-inch of peat from the surface of the prepared bog. The particles so produced are harrowed regularly to facilitate drying. This process is more rapid than with sods and the finely divided peat will dry out from 90 per cent moisture content to 50 per cent in two fine warm summer days. It is then scraped into ridges by tractors fitted with bulldozer-like attachments. Other machines take up the ridges and move them across adjacent production areas and drainage ditches until they coalesce at the rail pile.

A third method is the hydro peat process. As yet this is being employed on an experimental scale, at Derrylea bog near Portarlington, but it may, in the future, be extended to some of the mountain bogs and also to flat bogs containing a high proportion of wood, which hinders cutting machines. The peat is cut from the face of a trench by high-powered jets of water, and the mass of peat particles and water is carried off to settling tanks for separation. The damp peat is then spread out on the ground in sod form to dry.

The application of these mechanical methods has resulted in a steady rise in the output of peat fuel since the war.

Year	*Sod Peat*	*Milled Peat*	*Peat Briquettes*
	Production in tons		
1946	96,082	57,921	17,408
1948	122,607	44,736	16,647
1950	190,691	46,664	24,394
1952	524,678	90,000	29,908
1954	628,596	99,596	35,073
1955	679,218	341,933	40,826
1956	828,635	290,405	48,225
1957*	800,000	650,000	33,000

* Estimates

Sod peat production is mainly from the Clonsast, Ballydermot and Timahoe bogs between Portarlington and Edenderry, while that of milled peat is from the Lullymore bog, nearby, and the Boora No. 1 bog to the east of Birr. The largest schemes, all concerned with milled peat, have yet to come into production. In the year 1956/1957 the two peat-fired power stations operating at Portarlington and Allenwood produced 18 per cent of the total electricity generated in the Irish Republic. Their generating costs compared favourably with those based on imported coal. Oil is the cheapest fuel to use but social factors, especially the creation of more employment opportunities, together with security of fuel supply, favour a still greater dependence upon peat-fired power stations. Six more are now in course of construction, the one at Ferbane being the largest of its kind outside the U.S.S.R.

(Based upon production statistics supplied by the Secretary of *Bord na Mona* and the Annual Reports of the Electricity Supply Board. Further information about the use of peat fuel in electricity generation will be found in A. J. P. McCarthy's article "The Irish National Electrification Scheme" in *Geographical Review*, vol. 47, No. 4, 1957, pp. 539–54.)

Royal Navy, Portsmouth D. J. Dwyer.

EFFLUENT DISPOSAL AND INDUSTRIAL GEOGRAPHY

The problem of many industries is not only how to obtain water, but how to dispose of the effluent, or waste water, at the end of the process. In recent years there has been a growing awareness of the deterioration of many British rivers, and the Rivers (Prevention of Pollution) Act, 1951, was passed to try to check this menace. The Act, which does not apply to Scotland and Northern Ireland, has had quite important effects on industry. There had been Acts dealing with river pollution prior to 1951, but for various reasons they had often been ineffective, although some of the river authorities set up to administer the 1876 Act, e.g., The Mersey and Irwell Joint Committee (1891) and the West Riding Rivers Board (1893), did much valuable pioneering work towards the abatement of pollution in Lancashire and Yorkshire, and were instrumental not only in getting Local Authorities to construct proper sewage treatment plants, but also in persuading manufacturers to install treatment plants for trade wastes.

Under the 1951 Act, "a person commits an offence . . . if he causes or knowingly permits to enter a stream any poisonous, noxious, or polluting matter." However, a river board cannot prosecute without the consent of the Ministry of Housing and Local Government; and, when the offending effluent cannot be disposed of except to a river, it is a defence if all reasonable steps have been taken to render the effluent not unnecessarily poisonous, noxious, or polluting. Certain trade wastes can be improved quite easily, but it is particularly difficult to treat sulphite liquor from the pulping of wood, gas liquor, and waste from mills engaged on the dyeing of cotton goods. The dyeworks which use sulphide dyes have a particularly difficult effluent, which is opaque, coloured and high in sulphide content. A straw-pulping mill on the River Irwell, which has been termed the hardest worked river in the world, affords an example of gross pollution. Until recently 600,000 gallons of kier liquor were discharged into the river daily. Kier liquor, the waste from the pulping process, is dark brown, strongly alkaline, and contains a large amount of organic matter. The liquor produces a light brown scum and froth on the river, which persists for several miles downstream. Much pollution from this mill has now been abated, since the strongest liquors are sent for treatment at the caustic soda recovery plant of a nearby company.

Many mills have a high proportion of suspended solids in their effluent, and have built large sedimentation tanks, but where the amount of land available for construction purposes has been restricted, as in built-up areas or steep-sided narrow valleys, money has had to be spent on compact but expensive plant for effluent treatment. In the future, mills with large volumes of effluent may be located near to public sewers (if discharge there is permissible), or in areas where there is sufficient flat land on which to construct settling tanks.

In the case of a factory built after 1951, or when a factory built before 1951 wishes to change the nature and/or volume of its effluent, it is necessary to apply to the appropriate river board for consent to discharge the new effluent into the river. However, the Ministry does not have to be consulted if the board wishes to prosecute anyone for contravention of the standards which have been imposed. Thus, firms may find that they are unable to change their processes or raw materials, or to increase their output, unless they can assure the appropriate river board of a satisfactory discharge. Some new firms may also be unable to build factories on the banks of rivers unless they are able to satisfy the river board's requirements, or are able to dispose of their effluent elsewhere than to the river. Two chemical firms decided not to build factories in South Lancashire, as the sites they had chosen allowed effluent disposal only to the river, and they felt that they would be unable to meet the river board's standards.

At the moment, mills sited at the coast or on tidal water are exempt from the Act, but estuaries and tidal waters may be brought within the scope of the Act by order of the Ministry. At the present time, attempts are being made to extend the Act to cover the Dee estuary, and a migration of industry to the coast on any scale would almost certainly lead to numerous applications to the Ministry for similar extensions.

Should the Act succeed in improving the state of our rivers, there would be enormous benefits. Apart from the value of clean rivers from the point of view of health and recreation, there would also be direct benefits to industry. Less preliminary treatment of water would be needed in industries such as paper-making and textiles, which at the moment draw in what is little better than the accumulation of effluents from all those mills that are sited higher up the stream. The powers of the river boards are still somewhat limited, and Ministerial consent is often required before action can be taken, but, within the limits of their power, they are striving to stop unnecessary pollution, and restore the wholesomeness of our rivers.

(With acknowledgements to Dr. L. Klein, Chief Chemist, Mersey River Board. The problem is dealt with more fully in his book, *Aspects of River Pollution*, London, 1957.)

University of Liverpool J. R. Gibson.

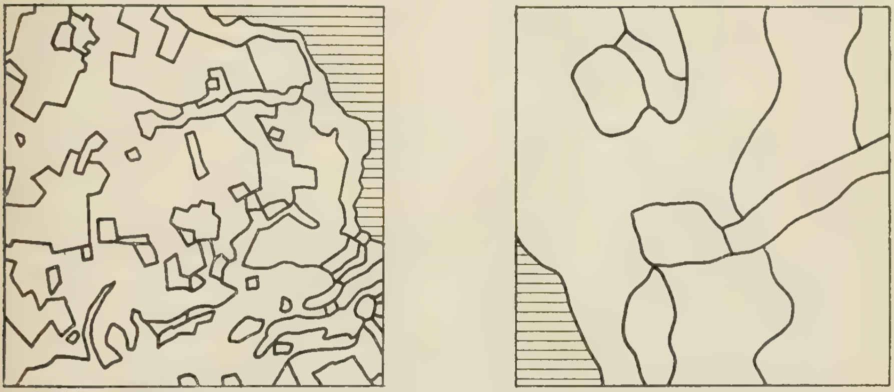
THE NEW ITALIAN LAND-USE MAP

In 1956 there appeared the first two sheets of the *Carta dell' Utilizzazione del Suolo d'Italia*, Sheets 19 and 20, covering between them the province of Calabria. The work is in the hands of a national committee, headed by Professor Carmelo Colamonico, who has long been the principal advocate of such a map. The map is drawn on the base of the 1:200,000 road map of the *Touring Club Italiano*, an organization well known for its enlightened patronage of geography and cartography. It is hoped that the remaining 24 sheets will appear over the next few years.

A national land-use map of this kind naturally challenges comparison with the land-use map of Great Britain. In the matter of source information the Italians are luckier than we were. The national Cadastral Office, in the course of its regular activity of registering the ownership of every parcel of land in the country, also records the use of the land of each parcel. This information is checked regularly, in theory quinquennially, by trained cadastral surveyors. While these records cannot provide information so nearly simultaneous as the field observations made in Britain, careful timing of the compilation of the different sheets of the land-use map should enable each part of the country to be mapped within a reasonable time after a revision.

The fundamental difference between the two maps, however, is in the scale. At a scale of one inch to one mile it is possible to show individually, at least under British conditions, the use of every parcel of agricultural land; at scales of the order of one quarter inch to one mile this becomes quite unreasonable, especially in a country like Italy where in many parts the parcels of land are themselves minute. The district around Paola, in Calabria, appears on the Italian map as one of the more complex areas on Sheet 20. When it is reduced to the same scale as the Lythe district in

North Yorkshire from the British map, it is immediately evident that a very different method must have gone into its compilation. The Italian map has, in fact, been produced by generalization. The symbols on the map do not mean, as they do on the British map, that in a particular year the use of a particular parcel of land was, for example, arable; but that in a particular period the area covered by the symbol was predominantly used in that way.



The map segment on the left represents the district round Lythe, North Yorkshire, showing boundaries of land-use divisions, and is taken from the Land Utilisation Survey sheet No. 16; that on the right represents the district round Paola from sheet No. 20 of the Carta dell' Utilizzazione del Suolo d'Italia. Both are reproduced at the scale of one inch to one mile.

This essential process of generalization is carried out in the following way. In the course of their normal work the surveyors of the Cadastral Service map the individual parcels of land in the field at scales of the order of 1:1000 to 1:2000, noting among other things the use of the land. These records are put together at the Cadastral Offices to form regular Cadastral Maps of every commune in the country. These commune maps are compiled at scales that range from 1:10,000 to 1:50,000 according to the complexity of the terrain; and they are coloured to show the land use as recorded by the surveyors. They are where possible true parcel-records, as in the British land-use map. In order to produce from them the present map at 1:200,000, two further processes are necessary. First the main generalization process is carried out at the scale of the commune map. Experienced workers (under the general direction of Professor Paroli of the Cadastral Service) strive to produce a tracing which will be technically reproducible at the scale of publication. This is achieved partly by eliminating small isolated parcels; partly by replacing numbers of small parcels by a token parcel of similar total area in the same general position; partly by representing areas of mixed land use by compromise symbols (e.g., alternating vines and olives by a vine/olive-land symbol). Lastly these tracings are photographically reduced to the scale of 1:200,000, and remaining separate areas measuring less than the minimum permissible (which varies from 3 millimetres square to 4 millimetres square) are eliminated.

In the matter of symbols the Italian map is rather more ambitious than was the British. The latter uses 15 symbols; but several of these (like the distinction between coniferous, deciduous and mixed woodlands and the different degrees of urbanization in the mauve areas) are simply a recognition of material recorded on the base map. The Italian key has 21 elements (not counting superimposed letters). Confusion is avoided, and a pleasant and legible effect achieved, by a graded system of colours and overlays. There are 7 basic tints, for arable (yellow); arable with trees (orange); fruits (pink); woods (green); pasture (two shades of blue); sterile land (ochre); settlements (grey). Each (except the last two) is sub-divided by over-printed symbols; the fruits, for example, are divided into vines, olives, mixed vines and olives, citrus fruits, soft fruits, and fruits with hard shell or pod. Among the woods, coppice, forest, mixed and chestnut woods are distinguished. Meadows are separated from rough pasture by a darker tint of blue. Arable and grass land are overprinted where irrigated. Advantage has been taken of the generalized character of the map to indicate the habitual presence of certain trees and industrial crops by letters placed over the general areas so characterized.

There are naturally even greater problems of definition involved in making such a map in Italy than in Britain, because of common practices such as growing fruit trees on crop or pasture land, pasturing animals in woodland or long fallow, and breck cultivation.

The responsible committee has also appreciated that such maps do not, for all their usefulness, fully explain themselves. The maps are being supplemented therefore by a series of memoirs, one for each province (*compartimento*), of which the first, for Calabria, has already appeared (*see Geography*, vol. xlii, 1957, pp. 256-8). Again the difference of scale is noticeable. There are in Italy at present 19 provinces, against 86 counties in Great Britain (Land-use memoirs number 79, allowing for combined counties), giving an average area of about 6000 square miles to a province against 1200 for a British county. The memoirs cannot then be expected to delve as deeply as their British counterparts. That on Calabria contains a valuable section on the physical background to land use in the province; then treats the principal types of land use and crops in turn, with dot maps for production of wheat, olives, grapes and citrus fruits. The original researches into the detailed physiognomy and origins of the cultural landscape, which were such a notable feature of the Land Use Survey Reports in Britain, are lacking here, and can scarcely be expected in future volumes dealing with such large areas.

University of Southampton G. W. S. Robinson.

THE NON-AFRICAN POPULATION OF THE FEDERATION OF RHODESIA AND NYASALAND

The first Census of Population of the Federation of Rhodesia and Nyasaland was held on 8th May 1956 and, apart from those Africans who were in employment, it was confined to the non-African population. It is not expected that the final report of the census will be completed until 1959 but preliminary results have been published and include data on the distribution of the population by race. Strict comparisons cannot be made with previous Territorial census results because no census was held in

Nyasaland in 1951 but the total figures for that Protectorate are too small to affect materially the conclusions drawn by comparisons on a Federal scale.

Of the Federation's 40 per cent increase in non-African population from 196,897 to 277,240 between 1951 and 1956, 54 per cent were in Southern Rhodesia, 38·5 per cent in Northern Rhodesia and the remaining 7·5 per cent in Nyasaland. Despite the larger portion of the increase being in Southern Rhodesia, that country fell behind in its share of the Federation's non-Africans relative to its two northern partners, since Northern Rhodesia increased its share of the total from 21 per cent to 26 per cent and Nyasaland from 5 per cent to 6 per cent whilst Southern Rhodesia fell from 74 per cent to 68 per cent. This is a similar northward movement of non-African peoples to that found in the Union of South Africa and it would appear that in part that movement in the Union has crossed the Limpopo, for of the total increase between 1951 and 1956 in those persons born outside the Federation, 21,386 or 40 per cent were born in the Union.

The non-African population of the Federation is predominantly urban and not only have total numbers increased considerably but the degree of urbanization is now greater, having climbed from 74 per cent of the total in 1951 to 78 per cent in 1956. At the same time the differences within the Federation, although considerable, are less marked than formerly, for Nyasaland which had only one-third of its non-Africans dwelling in towns in 1945 now has slightly over half as town dwellers. Northern Rhodesia is the most urban of the three territories having 84 per cent of its people urban whilst Southern Rhodesia lags only slightly behind with 78 per cent. The degree of urbanization reflects the contrasting economies of the separate territories; Northern Rhodesia, which has an economy based largely on mining, requires important concentrations of manpower; Nyasaland, with an almost entirely agricultural economy, has a dispersed settlement pattern. The marked urbanization in the Rhodesias and less but increasing urbanization in Nyasaland apply alike to Europeans, Asians and, on a much smaller scale, to Coloureds, as the following urban percentages show.

	European		*Asian*		*Coloured*		*Non-African*	
	1951	1956	1951	1956	1951	1956	1951	1956
Southern Rhodesia	74	78	94	93	62	67	73·5	78
Northern Rhodesia	84	85	81	83	43·5	44·3	82	84
Nyasaland	33·3	56·5	39	50·5	13·5	36	35	52
Federation	75	79	74	71	57	61	74	78

Despite the great urbanization of the non-Africans and the fact that there are 18 towns in the Federation each with a non-African population of over 1000, the urban population is concentrated mainly in three centres, Greater Salisbury having 30·5 per cent of the Federation's total urban population, Greater Bulawayo 21 per cent and the five towns of the Copper Belt jointly having 16·4 per cent. Together these three urban concentrations have over two-thirds of the Federation's non-African town dwellers, and over half the urban increase of non-Africans in the whole Federation between 1951 and 1956 was accounted for by these three centres.

It thus appears that in increased urbanization of the non-Africans and a northward gravitation of population, the Federation is following a pattern similar to that of the Union of South Africa.

Blantyre, Nyasaland C. Baker.

MANGANESE ORE IN NORTHERN BRAZIL

Since 1955 the Brazilian territory of Amapá, which lies between the mouth of the Amazon and French Guiana, has become the largest producer of manganese ore in South America and one of the world's leading exporters of this commodity. The ore is quarried at Serra do Navio in the valley of the Amapari about 100 miles from the coast, and the deposits, of 50 per cent metal content, total some 16 million tons in proved reserves and a similar amount in probable reserves. In 1956, 600,000 tons, worth £11½ million, were exported, making up almost half the value of Brazil's mineral exports (iron ore accounting for nearly all the remainder).

The deposits were discovered during a local gold rush in 1938–41, and mapped in 1946. A Brazilian company, in which the U.S. Bethlehem Steel Co. acquired a 49 per cent interest, was then set up to exploit the resources. Between 1952 and 1954 a railway 120 miles in length was built linking Serra do Navio to the town of Macapá, on the Amazon, where a loading pier for vessels of up to 25,000 tons was constructed. This was made possible by a 67 million dollar loan from the Export–Import Bank, and production began in 1954.

The iron and steel industry of south-eastern Brazil uses manganese ore produced in Minas Gerais, so the Amapá ore is available for export elsewhere. The development has already benefited the remote and little developed territory of Amapá, and food production has been stimulated by the presence of a large labour force in the region.

The deposits are of great strategic significance to the U.S.A. as a large part of U.S. imports of manganese comes from India and Africa. In the western hemisphere, Cuba and Chile were previously the only other countries with a significant output.

This new mineral development is a further example of how the Guiana plateau has become during the last decade one of the most important sources of metallic ores in South America. Already British and Netherlands Guiana together produce 37 per cent of the world's bauxite (in 1955, 5,600,000 tons out of a world total, excluding the U.S.S.R., of 15,200,000 tons), while more than half of South America's iron ore exports come from Cerro Bolivar and El Pao in the Venezuelan state of Bolivar where output in 1957 exceeded 16 million tons (see *Geography*, vol. xxxix, 1954, pp. 40–2).

University of Nottingham J. P. Cole.

THE POPULATION OF THE WORLD

One of the fundamental facts that every geographer should have always in his mind is the total number of people in the world. *The Demographic Yearbook* 1956, published by the United Nations in May 1957 (U.N. Publication

Sales No. 1956–XIII–5, paper bound $7.00), gives the figure for mid-1955 as 2691 millions. Of this number some 2325 millions are covered by the census enumerations of some 200 separate areas: additions and adjustments, including an allowance for the population of the U.S.S.R. which is the only large sovereign area without a census in the last decade, bring the total to 2691 millions. The margin of error is reckoned at 1% or less for Europe, Anglo-America, India and Australasia; 2% for Latin America; 5% for Africa, southwest and southeast Asia, and 10% for the Far East. For the world as a whole it may be as much as 5%. Comparable figures for each of the years 1920, 1930, 1940, and 1950 are 1810, 2013, 2246, and 2476 millions. These figures mean average increases of 1·0 to 1·2% per annum. The increase since 1950 has been at the very different rate of 1·6% per annum.

This quickening of the rate of growth is undoubtedly real and its causes are not in the least obscure. It results simply from the fact that the widespread application of medical and public health techniques in the underdeveloped countries of the world has brought about substantial reductions in death rates in the past ten years. A graph in which the death rates for the period 1950–54 for sixty countries are plotted against those for the period 1945–49 shows that, with only three exceptions which are numerically trifling, the death rates for the second period were lower than for the first, and most so in those countries where death rates have been high. "This reduction in mortality" says the report "is the most significant demographic event during the last decade, and the accelerated population growth may be explained by the stabilization of birth rates and the fall of the death rates."

The results of this acceleration in growth are startling. World population is growing at the rate of 120,000 a day or 43 millions a year. At the time these words see print it may be set at 2810 millions. It will fairly certainly be 3000 millions by 1962; it is likely to be 4000 millions by 1980 and, unless birth control on a very large scale leads to a significant decline in the birth rates of such countries as India and China, the United Nations demographic experts forecast a doubling of present population by the end of the century. These are figures to give any geographer very serious food for thought.

Not less disturbing is the unequal distribution of the increase among the continents and countries of the world. Over the world as a whole in the years 1950–55 birth rates averaged 34‰ (per thousand) and death rates 18 ‰, giving a rate of increase of 16‰. But in some continents the increase is much greater than this. In Latin America death rates have been reduced to 17–19‰ while birth rates are still very high at 40–45‰, so that the rate of increase is 25–26‰, the highest in the world. In Africa birth rates are very high at 45‰ but death rates at about 25‰ are still being lowered and the rate of increase at 20‰ is likely to increase. Throughout Asia (outside the Soviet Union) birth rates are high (38–45‰) but in some areas, notably India and China, death rates have been very high indeed (28‰) and rates of increase (13‰ for India and 19‰ for China) are relatively moderate. But both these rates apply to enormous populations and may be very sensitive to any further decline in death rates. In Anglo-America, Australasia and the Soviet Union, birth rates run at about 25–26‰ while death rates are lower than anywhere else (8–9‰) so that the rate of increase at 17‰ is just a little above the world average. In Europe birth rates are the lowest in the world (18–21‰) but death rates at 10–11‰ are higher than in the countries just named so that the natural increases at 7–11‰ are the lowest recorded, and are lowered about 1‰ further by continued emigration.

These regional differences in the rate of increase are yearly adding very unequal numbers to the populations of the six continents. Asia with a population (without the U.S.S.R.) of 1481 millions (i.e., 55% of the whole world) adds 24·0 millions a year to this total (Far East 13·3, the Indian area 6·3, southeast Asia 3·0, and southwest Asia 1·4 millions). Africa adds 4·3 to its 223 millions. Latin America and Anglo-America each had 183 millions in 1955, but the former adds 4·4 millions a year to the latter's 3·0. The increments of 3·2 and 3·4 millions gained yearly by the Soviet Union and Europe are almost the same, though their populations at 197 and 409 millions are very different. Natural increase plus immigration adds 0·3 millions a year to the 14·6 millions of Australasia. So it will be seen that Asia, Africa and Latin America, which broadly comprise the underdeveloped regions, are responsible for 32·7 millions of the world's annual increase, compared with only 9·9 millions in the developed regions of Europe, U.S.S.R., Anglo-America and Australasia. This increasing imbalance between the populations of the developed and underdeveloped countries does nothing to make the latter's problems any easier to solve.

University of Sheffield DAVID L. LINTON.

Obituary

PROFESSOR HERBERT KING

Professor Herbert King, head of the Department of Geography in the University and former University College of Hull from its establishment in 1928, died on March 1st, 1958. Born in 1897, he attended Wigan Grammar School, where in 1915 he was awarded the Powell University Scholarship. Three years of war service with the Sherwood Foresters, during which he was wounded in France, intervened before he entered Professor Roxby's department in Liverpool University. Graduating with first-class honours he was made, in succession, University Scholar, Fellow, Junior Lecturer and, in 1927, Lecturer. He was primarily a human geographer, and the results of his work at this time on the settlement and agricultural geography of south Lancashire, appeared in *Geography* and the *Journal of the Manchester Geographical Society*, and in his contribution in Professor Ogilvie's *Great Britain: Essays in Regional Geography*.

In 1928 he became one of the first members of staff of the newly founded University College of Hull, and until the appointment of Dr. G. Kimble as his first assistant in 1930, he ran the Department of Geography single-handed. Nevertheless he was very active in many other ways at the same time. He organized the Land Utilization Survey of the East Riding, and took part in the survey of field names in the Riding for the English Place-Name Society. From 1930 to 1933 he was Secretary to Section E of the

British Association, and from 1933 to 1937, Recorder. He also found time to engage in archaeological field work and to edit a journal devoted to civic matters.

During the Second World War he worked at the Board of Trade and the Ministry of Information. He returned to resume charge of a rapidly expanding department, and when the College became a University in 1954, he became first Professor of a department with about a hundred students and five other members of staff. His administrative services to the University likewise increased; he served as Chairman of the Library Committee, Dean of the Faculty of Science, and for a time assumed administrative responsibility for the new Department of Geology.

Before he came to Hull, he had worked on the pre-enclosure land use of the Yorkshire Wolds, and a lecture on this subject in January 1928 was the occasion of his first meeting with the Hull branch of the Association. From his arrival in Hull later the same year, he became a vigorous supporter of the branch, and served on the committee, as vice-president, and from 1947 to 1954 as president. He took a considerable part in two Spring Conferences held in Hull, the first in 1929, the second in 1951. From 1935 to 1937 he was a member of the Council of the Association, and for the latter part of that period of the Executive. He was always keenly interested in the teaching of geography in schools. He served on numerous examining bodies and gave courses of lectures and arranged exhibitions for teachers; his whole relationship to the Hull branch was an expression of his wish to help and his refusal to try to dominate.

The session 1954–5 was spent as Visiting Professor at the University of Rochester, U.S.A. By a sad irony, the lecture that he gave to the Hull branch on his return proved to be his last public appearance. He fought long and courageously against his illness, his strength of will and sense of duty bringing him into the University almost to the end of January, 1958, and making him deal with administrative matters from his sick bed almost to the very end. His publications are few, and in that respect unrepresentative of the energy and industry which he lavished on his Department, on the University, and on the Hull branch of the Association, all of which he served assiduously for thirty years.

G. DE BOER

The Geographical Association

SPRING CONFERENCE, ABERYSTWYTH, 1958

A seaside venue for the Association's Spring Conference this year allowed the organizers to include both upland and coastal studies in the programme. The Department of Geography and Anthropology of the University College of Wales, Aberystwyth is to be congratulated and thanked warmly for putting its resources so liberally at the disposal of the Association, in the form of leadership of field work and of lectures. We are grateful, too, to Dr. E. H. Brown (University College, London) and Mr. J. Oliver (University College of Swansea) for their assistance. The attendance at the meeting was higher than in any recent years and was probably a record—some 250 people. The accommodation was efficiently and comfortably catered for by the Halls of Residence of the University College of Wales; to the Acting Principal and to the Wardens of Alexandra Hall and Pantycelyn we express our appreciation.

Miss J. C. Coppock gave able assistance as local conference organizer. With his accustomed verve and Celtic energy, Professor E. G. Bowen directed the meeting and introduced many "English foreigners" to the characteristic Welsh settlements of West Central Wales.

It is hoped to publish Mr. Oliver's paper on "The Wetness of Wales" in a later issue of *Geography.*

G.A. SUMMER SCHOOLS, 1958

Applications may still be submitted for places on both courses to be held this summer: Field Work in Scotland (centred at Edzell, Forfar) from 28th July to 6th August; Geography of the Middle Rhinelands (centred at Kettwig and Mayen) 15th August to 28th August. Early application is strongly recommended; further details of programmes are now available.

BRANCH NEWS

A former branch of the Association has been revived at Crewe and members in the district are asked to support its activities. The Secretary, Mr. G. S. Hall, 8 Walthall Street, Crewe, will supply details of coming events on request: please send stamped addressed envelope with inquiries.

LAND FORM SURVEY

A number of readers have responded to Professor Linton's invitation to take part in the organization of a co-ordinated Land Form Survey of Britain, given in the last issue of *Geography* (January 1958, page 11) in the article on Morphological Mapping. Many more helpers will be needed, however, and until the full strength of voluntary and interested assistance is known, it will be difficult to embark on a preliminary plan for the Survey. Members who would like to participate in any survey work in their own locality are asked to write to Professor Linton at the Geographical Association office, enclosing a stamped addressed envelope, as soon as possible.

The Geographical Association now has reprints both of the article and of the map-diagram accompanying it, which will be helpful to lecturers and teachers who wish to introduce students and pupils to the techniques of morphological mapping. These can be supplied from the Geographical Association office at the following rates:

Reprint of article, including folded diagrams: 1s. 6d. each; 15s. per dozen for bulk orders.

Map-diagram sheet, folded for orders up to 10 copies: 6d. a copy; flat (sent rolled) for bulk orders: 3s. 6d. per dozen (prices include postage).

GEOGRAPHY AND AIR POLLUTION

Limited quantities of a reprint of an article by Dr. Alice Garnett are available for sale to members of the Geographical Association. Entitled "Atmospheric Pollution: Geographical Factors", illustrated, with 40 pages, the pamphlet costs 4s. post free. Orders should be sent, as soon as possible, to the Geographical Association office.

BACK ISSUES OF "GEOGRAPHY"

Members who wish to dispose of sets of *Geography* are urged to donate them to the Association. We are especially in need of copies of the earliest volumes from 1901 to 1928 and of various parts from 1944 onwards.

Reviews of Books

With very rare exceptions books reviewed in this journal may be borrowed from the Library by full members and student library members of the Association.

Ordnance Survey One-Inch Tourist Series, Lake District (Revised Edition). 32 × 40 inches. Paper, flat 4s., folded in covers 6s.; mounted on linen and folded in covers 8s. 6d. April 1958. Ordnance Survey Office, Chessington.

The outstanding feature of this new Tourist Map is that it is hill-shaded, with contours every 50 feet but without layer colouring. A beautiful example of cartography, it is a pleasure to the eye; by making the hills seem to stand out from the paper and the valleys to sink into it, the map gives the optical illusion of being a relief model. Whether or not it is a truthful model remains to be considered. It will be very attractive to the general public, who will feel that there will be no need to learn to read this kind of map. Indeed some parts are really exciting and make one long to be on the spot on foot—in the glorious O.S. sunshine! It is a map to hang on the wall, to browse over and to plan from; but whether it is one by which to find one's way or to study land forms with understanding is a matter of some doubt.

The hill-shading without related layer-colouring that is so novel in a modern British map is obtained by printing in transparent colour the illuminated sides a light apricot tint and the shaded sides in lavender tones, the light falling from the northwest at a high angle. Ground lower than 500 feet is tinted a pleasant light green, with a flattening effect on the appearance of notably irregular terrain. Of the same generous size as its layer-coloured predecessor of 1948, the map stretches very conveniently from tide-water at Ravenglass to A6 in the east, embracing the whole of the Skiddaw group of fells in the north and Black Combe in the south. The redesigned writing is clear and easy to read, yet unobtrusive. The symbols are generally those of the Seventh Series including, usefully here, the drawing of the whole rock faces. Fine black dots replace the grey tint for infilling the outlines of buildings; woods are not coloured; and the 10-km. National Grid lines are inconspicuous broken black lines. Parish boundaries are shown and the boundary of the National Park is printed strongly in green. The conspicuousness of the two through-roads might be an advantage as it emphasizes the great extent of land standing aloof from the busy flow of traffic.

Comparative altitude is a prime component of relief. In the reviewer's opinion, a completely false picture is given here of the general topography of the Lake District. Rapid reading of relief is wholly dependent on the effect of the hill-shading and very erroneous impressions will frequently be given. The two slope-tints almost completely share the interfluves, including the broad summits, giving the impression that the typical forms are long and continuous sharp-crested ridges, which are not in fact typical of a great deal of the district. More typical is the rounded summit-ridge with separate humps along it—very unlike the "roof-tops" of this map. The Scafell range, for instance, as depicted here is misleading to the casual user of maps for hill-walking, and unless he searched the tops for altitudes, a stranger would visualize the area from Helvellyn to Scafell as a sea of ridge-waves, all very much alike; yet on the earlier layer-coloured map, it is at the first glance immediately evident that the intervening ground between these two summits is everywhere well below them.

The shading can give rise to optical illusions of the wrong kind: Hardknott would appear to be a high col, while Wrynose is shown as a long, lower, easier defile; but it is only 10 feet lower and nearly as steep. On hummocky ground, so typical of parts of glaciated country, the shading fails entirely, and it conceals the great rock faces on the shaded sides—compare those south of Pillar with those northwest of Illgill

Head, Wasdale. A very serious defect is the obscuring, again on the shaded sides of the valleys, of the very significant changes of gradient.

Without layer-colouring to assist the eye, hill-shading, at least of this type, cannot convey a truthful picture of these glaciated highlands and may be positively misleading. This is a serious criticism of a map of a region of such value in geographical education. The same criticism would seem to hold for a new map of the same kind of Snowdonia or of the Scottish Highlands. The quite successful use of hill-shading in conjunction with layer-colouring in the Peak District Tourist Map of 1957 shows what the Survey cartographers can do, especially with regard to showing comparative altitudes of hill masses and the representation of broad-topped interfluves. That the average summit is at least 1000 feet lower there than in the Lake District of course made the task an easier one.

Another matter should command attention when a map is specially designed for the use of tourists. The information on historic and prehistoric sites should have the most authoritative editing possible. In this connection it might well be asked why some sites near the Haweswater shore are described as they are; the first maps of the former edition had a more up-to-date interpretation.

This attractive map will surely sell itself briskly and will enticingly initiate many of the public to map reading. Although it has this charming aesthetic appeal, it will not prove the best guide for the serious user of maps. For this reason it is to be hoped that the statement that the previous layer-coloured map "has been superseded" is not the final word of the Ordnance Survey; one hopes that the earlier edition will be kept in print—and even revised—and so will remain available for educational purposes, for the use of the more skilled open-air map reader and for the geographer.

F. J. C.

Ordnance Survey of Northern Ireland: Quarter-Inch Map of Northern Ireland. 40×30 inches. Paper, flat 3s., folded 4s. Mounted and folded 6s. 6d. Available Outline and water, 3s. January 1958. Ordnance Survey Office, Armagh House, Ormeau Avenue, Belfast.

This is a clearly printed map of the whole of northern Ireland (in the geographical, not the political sense) from sea to sea, northward of about lat. 54° N. It has a 10-km. grid, part of the "Irish Grid", on the "Transverse Mercator projection (which) has been adopted for all new mapping of Ireland", which is not related to the National Grid. The map is contoured at intervals of 250 feet and is layer-coloured in six tones of buff and brown. Frontier Customs Stations are indicated, and at present these presumably mark the only roads across the frontier that are open to traffic.

Large areas everywhere between the towns and marked villages are completely devoid of settlement symbols and place-names, giving an impression of a land that is largely empty and yet possessing innumerable networks of by-roads. Rural settlement is very dispersed over much of Northern Ireland, with isolated small farms closely scattered over the Townlands, and it would seem that all the farms, even when grouped into hamlets, fail to qualify for insertion under some convention of size-grading.

The questions arise as to what the purpose of the map really is and who are to be the purchasers and users. The information on the map suggests that it is for motorists who wish to pass through the most important places. The motorist for business or pleasure, however, cannot follow the by-roads—the principal feature of the map apart from the relief—unless he can find his way by dint of inquiry about where the road is going, or by looking for the local signposts. Cannot the smaller villages, the hamlets, selected farms and inns and local names be included in the map to help him?

F. J. C.

Wales. A Physical, Historical and Regional Geography. Editor, E. G. Bowen. 22 × 14 cm. 528 pp. Methuen and Co. Ltd. 1957. 42s.

The editor describes this volume, which is written by himself and six colleagues, as "the first comprehensive geography of the country that has ever appeared". Long awaited, it is now warmly welcomed and will take its place as the standard work for some time. The book has been delayed in order to await publication of 1951 Census Reports and it has been two years in the press. Consequently some sections, notably on economic development, are no longer up to date in detail.

The broad outlines of physical and historical geography (Parts I and II) are systematically drawn on the basis of material available when the book went to press. Part III is devoted to regional geography. Wales and its border counties are divided into The Heartland, West Coast, Anglesey and North Wales Coast, South West, South Wales Coalfield, Vale of Glamorgan and Gower, and Northern, Middle, and South-East Borderlands. This division can be justified although ports and hinterlands, market towns and contributory areas, and interdependent units in a pastoral economy are often severed by it. The authors have rightly treated their regions in the light of their own specialisms. Too rigid a scheme of regional treatment could have resulted in a dull book, yet a closer integration of material might have been attempted. For example, Cardiff's increasing industrialization is briefly mentioned in the chapter on the South Wales coalfield. As the city lies on the fringe of the Vale of Glamorgan it is included in that region and here the details of its great importance in the economy of Wales are not discussed.

The book is a useful one and it is hoped that a second edition will soon be necessary. Some standardization of maps might then be considered. The good chapters on population and language are illustrated by maps which show the boundary of Wales. Elsewhere the boundary is often omitted, both from maps dealing with Wales as a whole and from those dealing with the intricate Border country. The anomalous status of Monmouthshire is emphasized on several maps which show only half the county. Seven small points might be noted by the seven authors as indications of other minor errors. The spring flower used in phenological work is not the harebell, but the bluebell, and the original forests of Anglesey were not deciduous woods. Gower has received settlers from Somerset since 2000 B.C. and this link is closer than that claimed with Ystrad Twyi. Branch railways closed since 1945 in Wales include lines opened in the mid-nineteenth century and are not confined to twentieth-century ventures. Why do the industries of Hereford receive fuller treatment than those of Newport? A Scandinavian settlement of South Glamorgan is unlikely and Caerphilly castle is not Norman. Can the labour position in the Pontypool area be fully assessed when nylon is omitted from the list of industries on p. 378? Is Llandeilo a market town deliberately created as a centre for anglicization (p. 258) or is its origin ecclesiastical and its founder a Celtic saint (p. 350)?

The book gathers together a mass of information that was hitherto widely scattered. It should contribute to an understanding of some of the problems of Wales and ought to be made available to geography students in Wales and beyond its borders.

M. D.

Geographical Essays on British Tropical Lands. R. W. Steel and C. A. Fisher (editors). 14 × 22 cm. x + 344 pp. London: G. Philip and Son Ltd. 1956. 35s.

In his introductory essay Professor Steel is at pains to claim for the geographer a unique contribution in tropical studies. The interest and scope of the nine essays which follow certainly justify these wide claims.

On British West Africa in general Professor Steel discusses population problems and Dr. Harrison Church the development of the transport pattern; on Nigeria A. T. Grove analyses the causes and consequences of soil erosion in selected areas and concludes with pleas for thorough surveys and enforcement of regulations; other essays on Africa are a study of population migration in the Sudan and trade on Lake Victoria. In an appreciation of the present pattern of Jamaica's land use and settlement, E. Paget emphasizes the influence of land forms. In "Rainfall and Water Supply in the Dry Zone of Ceylon" B. H. Farmer uses modern climatological methods to find the measure of rainfall effectiveness derived from computations of evaporation data.

C. A. Fisher's long concluding double essay on the historical and recent political emergence of a united Malaya was written before self-government was granted in Malaya or Singapore. In spite of a retrospective flavour the doubts and warnings for their viability in independence are effective and salutory; this study is political geography at its best.

Successful symposia on this pattern will always be welcome, the more so if they are not quite so dated when they appear. The academic standards of this production are high and for the price asked they merit a format of more sumptuous quality. More photographs should have been allowed and larger-scale maps of some geographical value made to replace relatively useless sketch plans in some cases. The book lacks "eye-appeal", for the colour and lettering of the boards are unattractive and the dust cover is exceptionally drab. R. W. C.

The Rockliff New Project Illustrated Geography. Canada. P. R. Heaton. 14×22 cm. 335 pp. London: Rockliff Publ. Corp. 1957. 18s.

This, the first of a series of illustrated regional geographies for children aged 10 to 13 years, presents many new and unusual features. It consists of a symposium of 11 books (in this edition bound into one cover), the first dealing with the discovery of Canada, the remainder with the various regions. Much up-to-date information is included in the regional books, the pictures are well chosen, often with a human interest, the standard of reproduction is high and there is much useful ecological information. Each book also includes a section on ideas for the pupil's own work and a list of source material. The present development of each region is related to its historical background, in which Indian tribal life assumes an undue significance.

As a compilation of material from many sources, teachers will find the book valuable, but young pupils will experience difficulty in selecting the really significant from amongst the vast assortment of facts included. Maps tend to be overcrowded and difficult of interpretation, the lavish use of initials for place-names (with key) increasing the difficulty. Few maps include any indication of scale and occasionally symbols used in the key fail to coincide with those on the map.

The individual books are available separately, paper bound, at 2s. each for class use.

D. M. E.

Physical Geography (Series). Beaches and Coastlines. Rivers and Valleys. Glaciers and Glaciation. R. Kay Gresswell. 22×13·7 cm. 128 pp. London: Hulton Educational Publications. 1958. 7s. 6d. each.

These three books by the author of *The Sandy Shores of South Lancashire* (reviewed in *Geography*, vol. xl, 1955, p. 65) comprise a series intended for use in the middle and upper forms in grammar schools. They combine simplicity, conciseness, accuracy and prolific illustration.

The outstanding feature of the books is the large number of excellent photographs, maps and diagrams by which they are illustrated. In each volume the number of illustrations is greater than the number of pages of text, and the photographs in the vast majority of cases show quite clearly and obviously the features which they are intended to illustrate. The subject matter of the text is detailed—there are chapters on waves, beaches, river gradient and Pleistocene chronology which explain simply facts seldom dealt with in publications at this level—and indeed, this thoroughness of treatment is characteristic of the series. There are occasions when the author states as facts ideas which one had thought of as working hypotheses, and no source references are given in any of the books. But, bearing in mind the age of the readers for whom they are intended, one can appreciate the author's prime aim of simplicity. It is also unfortunate that *Beaches and Coastlines* is written in a style which is over-simplified and in parts liable to raise the hackles of any self-respecting fifth former. This criticism does not apply to the rest of the series and all three books could and should be read by fifth and sixth formers.

Secondary schools—technical, modern, or grammar—within striking distance of the sea could well invest in a set of the volume on coastal phenomena. Those who can afford full sets of the series in the middle school will find themselves with text-books teaching physical geography at a standard higher than anything yet attempted.

R. T. C.

Geography—Ordinary Level. General Certificate of Education Model Answers. 3rd edition. W. J. King. 21 × 13·5 cm. 82 pp. London: Artemis Press. 1957. 5s. 6d.

This book contains model answers to 38 questions of the type frequently found in "O" level papers. The answers are divided into those dealing with general and physical geography, world human geography and regional geography and are sub-divided into a total of ten sections.

The author, who is Senior Geography Master at a Middlesex school, presumably has considerable experience of "O" level examining, for, in addition to a page of general information entitled "Hints to Candidates", phrases such as "examiners expect . . ." occur when more specific points are dealt with. Indeed the text and answers have frequent interpolations of hints, instructions and suggestions. The answers themselves are models of conciseness and contain all or more than a fifth former could be expected to know.

The book could be of considerable use to one just beginning a teaching career who is asking "What do examiners want", especially if there is no more experienced person available to offer advice. But whether it is a book to be put in the hands of a pupil—and presumably it was written for this purpose—is a debatable question of pedagogical morals which the individual teacher must decide for himself.

R. T. C.

BOOKS RECEIVED BY THE GEOGRAPHICAL ASSOCIATION

PHYSICAL GEOGRAPHY

Seismicity of the Earth and Associated Phenomena. B. Gutenberg and C. F. Richter. 310 pp. Princeton, N.J.: Princeton University Press. (London: Geoffrey Cumberlege). 2nd ed. 1954. 80s. Includes discussion of geographical and geological relations of principal earthquake zones and list of active volcanoes.

Principles of Physical Geography. F. J. Monkhouse. 453 pp. London: Univ. London Press. 3rd ed. (with revisions). 1957. 30s. Also *Study Guide in Physical Geography*, 96 pp. 1956. 3s. 9d. limp covers.

50 *Jaren Geomorfologie*. J. B. L. Hol. 15 pp. Publ. B15, Geogr. Instit. Univ. Utrecht. 1957.

Das Eiszeitalter Band I: Die Allgemeinen Erscheinungen des Eiszeitalters. P. Woldstedt. 374 pp. Stuttgart: F. Enke Verlag. 1954. DM41.

Climate in Everyday Life. C. E. P. Brooks. 314 pp. London: Benn Ltd. 1950. 25s.

Weather Map. An Introduction to Weather Forecasting. Air Ministry Meteorological Office. M.O. 595. 105 pp. London: H.M.S.O. 4th ed. 1956. 10s. 6d.

Features of Evolution in the Flowering Plants. R. Good. 405 pp. London: Longmans Green. 1956. 30s. Illustrations by M. E. Malins.

Creatures of the Deep Sea. K. Günther and K. Deckert. Trans. E. W. Dickes. 222 pp. London: Allen and Unwin. 1956. 18s. Well illustrated.

MATHEMATICAL AND PRACTICAL GEOGRAPHY AND CARTOGRAPHY

An Introduction to Mapwork and Practical Geography. J. Bygott. 259 pp. London: Univ. Tutorial Press. 6th edition with revisions. 1957. 16s.

Mapping the World. E. Raisz. 112 pp. London: Abelard-Schuman. 1956. 12s. 6d. For secondary schools, lower and middle classes.

Decorative Maps. Heather Child. "How to do it series" No. 61. 96 pp. London: Studio Publications. 1956. 25s.

Topographical Maps and Photographic Interpretation. P. T. Silley. 59 pp. London: G. Philip. 1955. 10s. 6d. G.C.E. level. Appendices of exercises; questions on map and picture sets, of which 8 pairs are bound in the book; and bibliography.

Elements of Cartography. A. H. Robinson. 254 pp. London: Chapman and Hall. 1953. 56s.

CULTURAL GEOGRAPHY

Man on Earth. Jacquetta Hawkes. 256 pp. London: Cresset Press. 1954. 21s.

Seven Caves. C. S. Coon. 323 pp. London: Jonathan Cape. 1957. 28s. Archaeological explorations in the Middle East.

People for Australia. A study in population problems. A. Lodewickx. 230 pp. Melbourne: F. W. Cheshire. 1956. 30s. Discusses history of settlement and population problems in many lands, immigration and Australian potentiality for settlement.

ECONOMIC AND POLITICAL GEOGRAPHY

An Atlas of World Affairs. A. Boyd. 159 pp. London: Methuen. 1957. 15s. Seventy sketch maps and brief texts on political and economic affairs.

Chisholm's Handbook of Commercial Geography. Rewritten by L. D. Stamp and S. C. Gilmour. 915 pp. London: Longmans Green. 15th edition 1956. 70s. An essential book of reference for libraries.

Geographical Features of the Automation of Industry. D. G. Osborn. 106 pp. University of Chicago Dept. of Geography Research Paper No. 30. 1953. $3.

Blue Funnel. A History of Alfred Holt & Company of Liverpool 1865–1914. F. E. Hyde. 201 pp. Liverpool: Liverpool Univ. Press. 1956. 30s.

Statistics for the Social Sciences. T. G. Connolly and W. Sluckin. 154 pp. London: Cleaver-Hume Press. 1953. 16s.

A Concise Glossary of Geographical Terms. J. C. Swayne. 164 pp. London: G. Philip. 1956. 6s. 6d.

An Introduction to World Geography. G. Kish (editor). 634 pp. London: Constable & Co. 1956. 75s.

The World. A General Geography. L. D. Stamp. 669 pp. London: Longmans Green. 15th edition 1957. 15s. Revised. Chapter questions and exercises; appendix of examination questions.

BRITISH COMMONWEALTH

The Empire and Commonwealth Year Book 1957–8. R. S. Russell (editor). 533 pp. London: Newman Neame Ltd. 6th edition 1957. 50s. Work of reference on Commonwealth relations, organizations, definitions; economic, geographical and historical details of Commonwealth countries; raw materials and commodities.

An Economic Geography of the Commonwealth. Prepared by the Economist Intelligence Unit. 296 pp. London: Blackie. 1957. 15s.

A Review of Commonwealth Raw Materials. Volume I. Commonwealth Economic Report No. 37. 288 pp. London: H.M.S.O. 1958. 15s. Reviews generally mineral and organic raw materials and the main sources of energy; 209 tables. Detailed studies by countries to be issued in Volume II.

Commonwealth Economic Committee Commodity Series. Reviews of production, trade and consumption relating to Plantation Crops (1956), Industrial Fibres (1958), Grain Crops (1957), Fruit (1958). H.M.S.O. 5s. each.

The Commonwealth of Nations. Central Office of Information. H.M.S.O. 1957. 1s. Pamphlet of general information.

EUROPE AND EUROPEAN COUNTRIES

Europe. A Systematic Regional Geography Volume II. J. F. Unstead. 404 pp. 3rd edition 1957. 21s.

A Geography of Europe. J. F. Gottman. 724 pp. New York: Henry Holt. Revised edition 1954. 50s.

Western Europe. E. D. Laborde. 284 pp. London: Univ. London Press. 1955. 17s. 6d. Includes Iberian Peninsula, France, Italy, Switzerland, Germany, Benelux and Scandinavian countries and the British Isles. Advanced and Scholarship level.

The British Isles. A Systematic Regional Geography Volume I. J. F. Unstead. 292 pp. London: Univ. London Press. 4th edition 1956. 12s. 6d.

Victoria County Histories. Oxford. Vol. V, Bullingdon Hundred. M. D. Lobel (ed.) 1957. *Warwick,* Index to Vols. I–VI. 1955. *Wiltshire,* Vol. I, part 1. R. B. Pugh and E. Crittall (eds.). 1957. The Wiltshire volume consists of an article on the physique of the county and a gazetteer of all prehistoric Roman and Pagan Saxon sites in the county; maps of sites and finds have morphological base map.

Roman Roads in Britain Volume I. South of the Foss Way—Bristol Channel. I. D. Margary. 255 pp. London: Phoenix House. 1955. 42s.

Map of Roman Britain. Ordnance Survey. 16 miles to one inch. Text and index. 3rd edition 1956. Paper covers, 7s. 6d. Revisions from 2nd edition in 1928.

Map of Monastic Britain. Ordnance Survey. 1 : 625,000. With text, 1954. South sheet, 9s.

A Development Plan for the County of Derby. Analysis of Survey and Written Statement. Derby: County Planning Officer. 1951.

Peak District National Park Development Plan. Report and Analysis of Survey. Bakewell: Peak Park Planning Board. 1955. 7s. 6d.

Development Plan. County of Cornwall, Report of the Survey 1952. Part I, The County. Truro: County Planning officer. 1952. 11s. 6d.

The Making of the English Landscape. W. G. Hoskins. 240 pp. London: Hodder and Stoughton. 1955. 25s.

Lancashire in the *Making of the English Landscape Series.* R. Millward. 128 pp. London: Hodder and Stoughton. 1955. 16s.

Cornwall in the *Making of the English Landscape Series.* W. G. V. Balchin. 128 pp. London: Hodder and Stoughton. 1954. 16s.

Kent–Essex. Vision of England Regional Books. R. Turnor and P. F. Gaye. 268 pp. London: Elek Books. 1956. 21s.

The Coasts of Cornwall. S. H. Burton. 216 pp. London: Werner Laurie. 1955. 16s.

The Northern Region. Publication No. 7 of the North East Industrial and Development Association. December 1956. 1s. This pamphlet, produced biennially, provides an analysis of the employment position in the North East. Other publications of the N.E.I.D.A. are held by the G.A. library.

The Isle of Lewis and Harris. A Study in British Community. Edinburgh Univ. Publications, Geography and Sociology No. 2. A. Geddes. 340 pp. Edinburgh: University Press. 1955. 42s.

Coastwise Shipping of the British Isles. Its Structure and Routes. H. Rees. Cuttings from *Modern Transport* July to December 1955.

Les Plaines de Craie: du Nord-ouest du Bassin Parisien et du Sud-est du Bassin de Londres, et leurs Bordures. Etude de Géomorphologie. P. Pinchemel. 502 pp. Paris: Armand Colin. 1954. With photographic plates and folded maps and diagrams.

The Making of Dutch Towns. A study of urban development from the tenth to the seventeenth centuries. G. L. Burke. 176 pp. London: Cleaver-Hume Press. 1956. 35s. Foreword by Sir W. Holford. Many early plans and photographs.

Die Haarlemmermeer. C. van Paassen, P. J. W. Kouwe and G. A. Wissink. 424 pp. Socio-geographic studies of University of Utrecht, No. 1. 1955. f.10. Problems of a polder-community in highly urbanized surroundings. With English summary.

Historische Geografie van Westelijk Zeeuws-Vlaanderen. M. K. E. Gottschalk. Vol. I, 236 pp. and Vol. II, 290 pp. Socio-geographic studies of University of Utrecht, No. 3. 1955 and 1958. Historical geography of the western part of Flemish Zeeland. French summaries.

Finland and its Geography. R. A. Platt (editor). An American Geographical Society Handbook. 510 pp. London: Methuen. 1957. 60s.

Agricultural Conditions in Czechoslovakia 1950. W. Horbaly. 104 pp. University of Chicago Dept. of Geography Research Paper No. 18. 1951.

A Geographical Analysis of Two Villages in the Peloponnesos. A. C. de Vooys and J. J. C. Piket. 55 pp. Publ. A16 Geogr. Instit. Univ. Utrecht. 1958. Field study report on village studies in Greece; material for local studies.

ASIA

The Social Implications of Industrialization and Urbanization. Five studies of urban populations of recent rural origin in cities in southern Asia: Bangkok, Bombay, Dacca, Delhi, Djakarta. 268 pp. Unesco: Research Centre on the Social Implications of Industrialization in Southern Asia. Calcutta. 1956.

Land Reform and Development in the Middle East. D. Warriner. 197 pp. London: Royal Institute of International Affairs. 1957. 18s. Examines major changes brought about by agrarian reform in Egypt, mechanized farming in Syria and investment of oil revenues in Iraq; new forms of agricultural organization in the three countries.

Israeli Shipping and Foreign Trade. B. Boxer. 162 pp. University of Chicago Dept. of Geography Research Paper No. 48. 1957. $3.

The Hashemite Kingdom of Jordan. P. G. Phillips. 192 pp. University of Chicago Dept. of Geography Research Paper No. 34. 1954. $3. A physical and cultural study of Jordan.

A Geography of Ceylon for Schools. A. D. Baptist. 258 pp. Madras: Orient Longmans. 1956. Rs. 4-4-0. Written for use in upper classes in Ceylon schools.

India, Pakistan, Ceylon and Burma. L. D. Stamp. 220+xix pp. index. London: Methuen. Reprinted 1957 from the 9th edition of *Asia: A regional and economic Geography.* 12s. 6d.

East of Everest. An Account of the N.Z. Alpine Club Himalayan Expedition to the Barun Valley in 1954. E. Hillary and G. Lowe. 70 pp.+48 pp. plates. London: Hodder and Stoughton. 1956. 21s.

Nepal Himalaya. H. W. Tilman. 272 pp. Cambridge: Cambridge Univ. Press. 1952.

Nanga Parbat Pilgrimage. A Mountaineer's Autobiography. H. Buhl. Trans. H. Merrick. 360 pp. London: Hodder and Stoughton. 1956. 25s.

Malayan Animal Life. M. W. F. Tweedie and J. L. Harrison. 237 pp. London: Longmans Green. 1954. 18s. Black and white illustrations.

AFRICA

The Quest for Africa. Two Thousand Years of Exploration. H. Schiffers. Trans. D. Pyke. 352 pp. London: Odhams Press. 1957. 25s.

The Travels of Mungo Park. Ronald Miller (editor). Everyman's Library No. 205. 386 pp. London: J. M. Dent. Enlarged and revised edition 1954. 6s.

H. M. Stanley: Unpublished Letters. A. Maurice. 183 pp. London: W. R. Chambers. 1955. 21s.

Livingstone's Travels. J. I. Macnair (editor) with geographical sections by R. Miller. 429 pp. London: J. M. Dent. 1954. 21s. Compiled from Livingstone's diaries.

The Way to Ilala. David Livingstone's Pilgrimage. F. Debenham. 336 pp. London: Longmans Green. 1955. 25s.

Races of Africa. C. G. Seligman. Home University Library. 236 pp. London: Oxford University Press. 3rd edition, revised under the editorship of P. Schapera, 1957. 7s. 6d.

Trade Routes of Algeria and the Sahara. B. E. Thomas. Univ. of California Publications in Geography, vol. 8, No. 3. 123 pp. Berkeley: Univ. of California Press. 1957. $2.50. Includes post-war developments; lengthy bibliography.

The Benue Valley. A. T. Grove. 94 pp. Kaduna: Ministry of Natural Resources, N. Nigeria. 1957.

The British East African Transport Complex. I. S. van Dongen. Univ. of Chicago Dept. of Geography Research Paper No. 38. 172 pp. 1954. $3.

Relational Patterns of Kampala, Uganda. E. S. Munger. Univ. of Chicago Dept. of Geography Research Paper No. 21. 165 pp. 1951. $3. Description and analyses of the political, economic and social relationships of Kampala with a complex series of hinterlands in eastern Africa.

Factors of Economic Development and the Okovango Delta. D. Randall. Univ. of Chicago Dept. of Geography Research Paper No. 47. 268 pp. 1957. $3. Some world relationships to and problems of planning for economic development of an underdeveloped area in Africa.

South African Scenery. A Textbook of Geomorphology. L. C. King. 379 pp. Edinburgh: Oliver and Boyd. 2nd edition revised 1951. 45s.

Sierra Leone and the Gambia. Uganda. Central Office of Information. H.M.S.O. 1957. 4s. each. Sets of 6 plates in each case, on spiral binding, 15 × 12 in.

Geographical Articles

Listed from Periodicals received in the Library

CONTINUED FROM VOL. XLII, PP. 199 TO 200

Journals listed here may be borrowed from the Library by members of the Association. References are listed according to the classification published in the *Annals of the Association of American Geographers*, vol. xxvii, June 1937. Authors' reprints presented to the Library are included in the list of articles.

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(E)—English summary. (G)—German summary. *—Maps.

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ECONOMIC GEOGRAPHY. H. ABRAHAMSON, SGA, Vol. 33, '57.—Mechanization of agriculture. M. B. BALLABON, EG, July '57.—Putting the "Economic" into Economic Geography. R. CARALP, RGL, No. 1, '57.—L'introduction de nouvelles régions dans l'économie mondiale. R. CARALP, RGL, No. 2, '58.—Notes pour une géographie de l'uranium. Z. CHOJNICKI, PG, Pt. 2, '57.—An appraisal of the achievements of Polish geography of transport (E). R. DICKINSON, GR, Oct. '57.—Geography of commuting: the Netherlands and Belgium. W. L. GARRISON and F. M. DUANE, A of G, June '57.—Spatial structure of agricultural activities. N. GINSBURG, A of G, Sept. '57.—Natural resources and economic development. A. GROTEWOLD and I. GROTEWOLD, EG, July '57.—Geographical aspects of international trade. E. HAMMING, EG, Jan. '58.—Water legislation. J. KOSTROWICKI, PG, Pt. 1, '57.—Geography of agriculture in English-speaking countries: lengthy bibliography (E). W. KRZYZANOWSKI, PG, Pt. 2, '57.—Theoretical economic problems of geography of transport (E). A. J. DE MATOS MUSSO, BG, May–June '56.—O ciclo industrial. E. M. NICHOLSON and others, A of Sc, June '57.—Effects on agriculture of changes in the balance of nature. J. F. DE PRADO, BG, May–June '55.—Aspectos sociais da cultura do cafe (social aspects of the cultivation of coffee). L. D. STAMP, GR, Jan. '58.—Measurement of land resources. L. M. DE M. STRRUCH, RBG, Jan.–Mar. '55.—Contribucao ao estudo geografico da Erva-Mate (geographical study of Yerba-maté). P. VEYRET, BG, Jan.–Feb. '56.—A pecuaria na zona tropical. G. VIERS, BG, Jan.–Feb. '55.—O cacau no mundo (cacao in the world). L. WAIBEL, BG, Nov.–Dec. '54.—A forma economica da "plantage" tropical (tropical plantation economy). L. WAIBEL, BG, Mar.–Apr. '55.—O abastecimento da zona temperada com produtos agricolas tropicais (provision of the temperate zone with tropical agricultural products). L. C. WHITE, GR, No. 4, Oct. '57.—Water—a neglected factor in the geographical literature of iron and steel. M. WOIKOWITSCH, BHG, Dec. '57.—La circulation (bibliography).

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Cultural. H. J. BHABHA, A of Sc, Dec. '57.—Atomic power development in India and the Indian atomic energy programme. S. P. CHATTERJEE, GRI, June '57.—Changing map of India. G. B. CRESSEY, PFG, Sept. '55.—Source material on Communist China. G. B. CRESSEY, A of G, June '57.—Water in the desert. K. A. DEB, GRI, Mar. '57.—City regionalism in India. E. H. G. DOBBY and others, MJTG, June '57.—Padi landscapes of Malaya (II). J. DRESCH, BAGF, Mar.–Apr. '56.—Le Kyzyl Koum et la sédentarisation des nomades. D. N. GANGULY and B. N. MITRA, GRI, June '57.—Distribution of (fish) fry collection centres, methods of collection and the fry trade in the river Bhagirathi (West Bengal). P. GEORGE, BAGF, Mar.–Apr. '56.—L'oasis de Tachkent. J. S. HAUPERT, J of G, Nov. '57.—Boundaries and frontiers of Israel. B. L. C. JOHNSON, OG, July '57.—Site and urban regions of Chittagong. P. P. KARAN, EG, Oct. '57.—Iron mining in Singhbhum-Mayurbhank region of India. P. P. KARAN, J of G, Nov. '57.—Locational pattern of the new centres of the Indian iron and steel industry. Y. KEDAR, GJ, June '57.—Water and soil from the desert: some ancient agricultural achievements in the central Negev. F. K. KHAN, OG, July '57.—Kazikasba, Panam and Joradeul—a study in land use. M. N. KHAN, OG, July '57.—Rural settlement patterns and house types in Sind. J. LAUGENIE, RGL, No. 4, '56.—Le port de Beyrouth. J. H. G. LEBON, BE, Vol. 29, '56.—Site and modern development of Baghdad. H. LECHLEITNER, MW, Pt. 3, '55.—Zur wirtschaflichen Situation der Republik Indonesien. A. MELAMID, A of G, Sept. '57.—Political geography of the Gulf of Aqaba. S. MUKHERJEE, GRI, June '57.—Villages and towns of West Bengal. P. RAO, OG, July '57.—Land use in India—its scopes and problems. B. SINHA, GRI, June '57.—Natural regions of Orissa. E. T. STROM, SGA, Vol. 33, '57.—Turkish agricultural production and its regional differentiation. J. H. THOMPSON, EG, July '57.—Urban agriculture in southern Japan. G. WHEELER, GJ, June '57.—Recent developments in Soviet central Asia. R. WIKKRAMATILEKE, EG, Oct. '57.—Hambegamuwa village: an example of rural settlement in Ceylon's dry zone. R. WIKKRAMATILEKE, GS, No. 2, '57.—Whither "Chena"? The problem of an alternative to shifting cultivation in the dry zone of Ceylon. F. ZWEIG, SR, Dec. '57.—Working classes and the social framework in Israel.

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B. L. C. Johnson

LOWER BERG. A DISTINCTIVE REGION BETWEEN RHINE AND RUHR 104
T. H. Elkins and E. M. Yates

TEACHING GEOGRAPHY IN MALAYA

I. IN A BRITISH ARMY SECONDARY SCHOOL 114
W. J. Bennett

II. IN A FEDERATION SECONDARY SCHOOL 118
P. P. Courtenay

THIS CHANGING WORLD
Edited by G. J. Butland

PEAT FUEL PRODUCTION IN THE IRISH REPUBLIC. *D. J. Dwyer* 126

EFFLUENT DISPOSAL AND INDUSTRIAL GEOGRAPHY. *J. R. Gibson* 128

THE NEW ITALIAN LAND-USE MAP. *G. W. S. Robinson* 130

THE NON-AFRICAN POPULATION OF THE FEDERATION OF RHODESIA AND NYASALAND. *C. Baker* 132

MANGANESE ORE IN NORTHERN BRAZIL. *J. P. Cole* 134

THE POPULATION OF THE WORLD. *D. L. Linton* 135

OBITUARY

PROFESSOR HERBERT KING. *G. de Boer* 136

THE GEOGRAPHICAL ASSOCIATION 138

REVIEWS OF BOOKS 139

RECENT GEOGRAPHICAL ARTICLES 147

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